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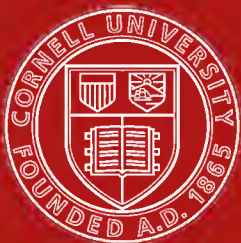
LEADERSHIP



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INDUSTRIAL LEADERSHIP



COMPLETE REPORT OF THE PROCEEDINGS OF THE
SPRING NATIONAL CONVENTION

HELD UNDER THE AUSPICES OF

THE SOCIETY OF INDUSTRIAL ENGINEERS

At the Auditorium, Milwaukee, Wisconsin
April 27, 28 and 29, 1921

L. H.

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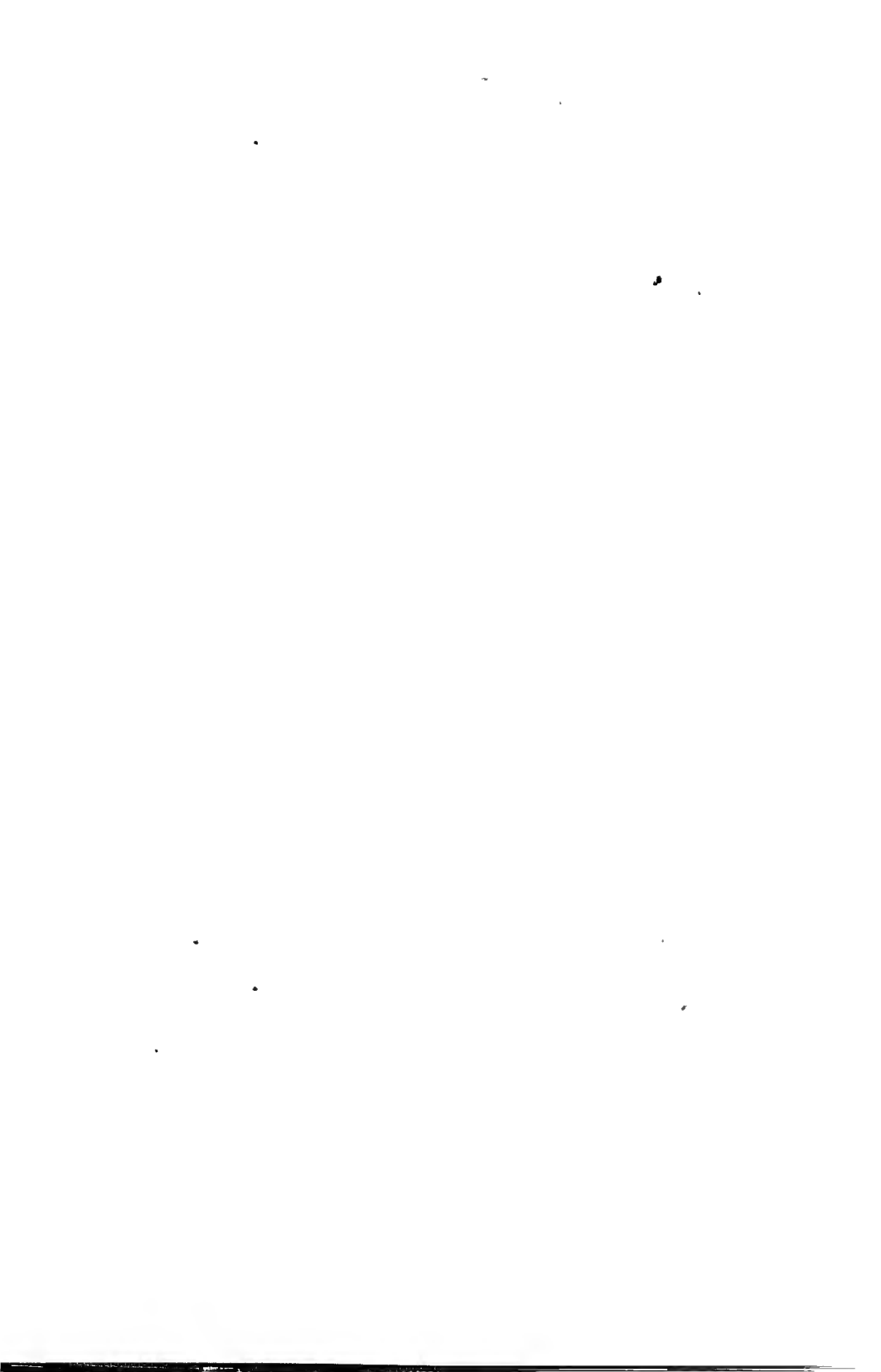


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OPENING SESSION

Wednesday Afternoon, April 27, 1921

Chairman: L. W. WALLACE

President The Society of Industrial Engineers

THE CHAIRMAN: Dr. William T. Dorward, of the Tabernacle Baptist Church, will deliver the invocation.

DR. DORWARD: Our heavenly Father we thank Thee for our daily work and daily power to do it; for the giving which makes us richer; for the service which makes us stronger; for the trials which give us courage, and for the call that we have heard—the call of humanity that joins us with Thee in Thy work.

We thank Thee that Thou has brought these men and women from distant parts here safely. Crown their efforts this week with abundant and abounding success, and when they shall go home from this place of information and inspiration, may it be with a holier determination to solve some of the problems that are near their heart. We ask it all in Thy name, Amen.

THE CHAIRMAN: We are to be favored with an address of welcome by Mr. Puelicher, President of the Marshall & Ilsley Bank of Milwaukee.

ADDRESS OF WELCOME

MR. JOHN H. PUELICHER: Engineers—efficiency engineers—welcomed by a banker! Willits Pollock is responsible for this and he hasn't been in the banking business long enough to know that as a banker grows older he shrivels in certain respects—not in the soul nor in the warmth of his heart, but he shrivels in other respects, and as time goes on, his vocabulary begins to reduce itself. By the time a banker gets to be my age, his vocabulary is usually down to about one word, and that is—"no", unless the collateral is good. (Laughter) So any word of welcome by a banker must be multiplied by the years of his service to get any idea of its warmth. That is a task for an efficiency engineer and I'd like to know later on how really welcome I made you.

But I want to say to you that you are welcome to our community: We are glad to have you here. We are proud of our community and are proud to have a distinguished body of men hold their convention in our city.

A convention, to me, is always much like a family gathering—composed of men of the same calling, making up the family of that calling, coming together and comparing experiences, working out new methods for serving, proud of the distinction achieved by those of their numbers who have achieved distinction and lending a willing hand to those who are yet on the road toward distinction.

Industrial engineering is a thing that we of course should be aiming to achieve. "Industry"—I ran across a definition of the word the other day in an editorial in a financial paper and as Mr. Pollock had said something about my coming to you, I couldn't refrain from copying it because it was so fine a description of the quality—industry, and you in your work are endeavoring to make industry more interesting, endeavoring to take the grind out of it, to make it more efficient, and to make it do more for the world and for your kind.

"Industry is irresistible—a vital element in character, the nourishing spiritual principle at the root of all human achievement. With it, by it, the fine ambitions of life are accomplished; upon it rests the entire structure of progress, home, government, invention, art, science and every branch of learning; it has inspired education and civilization; founded and stabilized human rights; established ways and means for enlightened living.

"From it come prosperity and wealth with their power to promote benevolence, religion, law, order and all the enterprises which open avenues to success for men in all employment. It is the decisive test of character, reputation, honor, distinction; all bodily strength, brain force, aspiration, opportunity, perish if not vitalized into action by the work habit; even genius—man's rarest and supreme gift, is futile without diligent industry, ever essential to its perfect functioning.

"Whence comes this immeasurable power to man, this influence that sends him to the ends of the world, crowds him to the limits of endurance and to topmost peaks of courage and resolution? From his Maker, who endowed him with will, the mighty control by which he subdues his passions, dominates his muscles, drives his intellect, and centers his purpose on habitual industry."

To me that is a wonderful tribute to industry.

And now, what have you to do with industry? You direct it intelligently, you make it effective, you show how it can be made efficient. You make work do what the worker intends it should do and you are filling a

valuable place in the world's work. You have great opportunities for doing good but with the opportunity goes responsibility, and you are charged with the responsibility of doing your work with integrity, doing it honestly that no fault can ever be found with it. No gain should ever tempt you to do it in any other way.

Thinking of this this morning, I tried also to think what human beings prize most. Next to earning, that which buys the daily bread, and next to doing one's work well, one wants to stand high in the regard of his friends and neighbors, and if possible leave just a bit of work that will occasionally recall his name after he has gone over the long way. We call the last, "fame", and I wondered what was the price of fame, and this occurred to me—

"Service, intelligent, honest service, is the price which the creator has placed on fame."

Therefore, the engineer, the banker, the merchant, the preacher, the statesman that hopes to be remembered must have one ideal—service—disinterested, intelligent, whole-hearted service.

I hope your stay in Milwaukee will be made pleasant. Milwaukee is a community that extends its hospitable arms to many gatherings. Possibly I should have told you something about our community—those of you who are strangers to it. It is a cosmopolitan community with some 28 peoples who have settled here. We had sketched out by an engineer a racial map of our city and we found that these races were not intermingling as we sometimes think they should in what we are pleased to call the melting pot of America. We love America. No matter what our vocation, no matter where we go, our work should always impart and take care of our wants, but the major portion should have in mind the service to be rendered our kind and our country.

I hope your presence here and some of your work will give consideration to what ought to be given consideration in every gathering in America—the greater Americanization of America.

And now may I leave you with just this parting wish—

"May the giver of gifts give unto you

That which is good and that which is true,

The will to serve and the courage to do.

Whether skies be gray or skies be blue,

May the giver of gifts, give these unto you."

(Applause)

THE CHAIRMAN: Members of The Society of Industrial Engineers and visitors—we are indeed gratified that you are here because it indicates an intense and sincere interest in the great realm of industry that our pres-

ident banker friend has just referred to. Industry is a very important factor in the world of affairs—it has been the purpose of this organization in a small way and in its weak way.

We may add to the furthering of industrial life and industrial activity in this country by having conferences from time to time of those who are directly connected with industry or who are intense students of it, and the primary purpose of the S. I. E., as stated in its constitution, is to render public service by enhancing the effectiveness of American industry.

It has been an interesting and a promising feature, I think, that in recent months, or perhaps in recent years I should say, that our banker friends have become more and more interested in our activities and it is gratifying to note that some of our very large banks now have on their staffs industrial engineers. We hope to see that tendency grow and we feel that when more banks have well-qualified industrial engineers on their staff, industry will become in such a state of solvency that the banker will not have to say “no” so often. (Laughter)

The topic that has been assigned to me is “The Responsibility of Industrial Leadership.”

“THE RESPONSIBILITY OF INDUSTRIAL LEADERSHIP”

L. W. WALLACE

Washington, D. C.

Our late great American statesman and private citizen, Theodore Roosevelt, once said, “The problems with which we have to deal in our modern industrial and social life are manifold, but the spirit in which it is necessary to approach their solution is simply the spirit of Honesty, of Courage and of Common Sense.”

The problems that our industrial leaders confront today are manifold in number and in complexity. They are capable of satisfactory solution provided they are approached in a spirit of Honesty, of Courage and of Common Sense. There is nothing to be gained by any industrial leader fooling himself or in attempting to fool others as to the facts that now confront industry in general. This is a time that calls for candor and a frank facing of facts. We have said in previous addresses that a lack of knowledge of fact on the part of management and of labor had accounted for many misunderstandings, which resulted in a serious interference with the even tenor of production.

Today, as never before in the history of industry there is a necessity for candor and absolute honesty.

It is the responsibility of industrial leadership to make known to the great army of wage earners of America the economic facts controlling the industrial and commercial life of this nation and of the world. Our faith in the American Workman is so well founded as to cause us to venture the

suggestion that the executive head of every industrial enterprise honestly and frankly set about to inform his employees as to world and national conditions that are affecting industry today. The industrial wage earner should be fully informed as to what the real economic conditions of Europe are,—as to what the governmental conditions are; what the demands of labor are and what are the underlying causes for the same.

More information and less hearsay is the need of the hour. We can conceive of no more important task for the industrial leader to perform than just this: Give the economic facts governing world industry to the masses of industrial workers.

With such a background formed, then take them into your confidence as regards your business. If this be done, much hearsay and the restlessness and disturbance resulting therefrom will be materially eradicated.

Not only should industrial leaders frankly discuss such matters with their employees, but they should feel the responsibility of informing the public on such phases of their respective enterprises as effect the public. If this policy of candor had been followed by our industrial leaders, much violent legislation and commission or board control of industry would never have materialized.

We realize that it will require courage to adopt a policy of "pitiless publicity." But we are confident that such courage will be rewarded by the satisfactory results that will accrue. And many of the facts that have been held back fairly belonged to the public.

The industrial leader needs to be more than purely an industrialist. The industrial leader, by virtue of the fact that he has within his control the destinies of hundreds of thousands of workers and their families has a peculiarly significant responsibility to meet as a citizen. He cannot shut his eyes to the condition of the schools, of the streets, of the public utilities of the community in which his workers reside. If he fails to make his executive ability felt in all matters of community concern, then he has failed to meet his responsibility as an industrial leader.

Any student of industrial problems will tell you that the home surroundings, the community spirit, the transportation facilities and many other purely community matters have a material bearing upon the attitude and productivity of the workers. The industrial leader should realize this and interest himself in such public affairs. As an executive of large experience and proven ability, he owes much to the community that houses his employees. He owes it to his employees to see to it that the community adequately and comfortably houses them in the way of community necessities and comforts.

A short time ago a prominent attorney when addressing a body of engi-

neers about Mr. Hoover said, "Mr. Hoover is not a great world figure only because he is an eminent engineer, but because he is more than an engineer." He has interested himself in matters outside of the strict realm of his profession, the consequent result being that he has been permitted to do engineering work of the highest order and of the most constructive character. Today, too many industrial leaders limit this practice, if you please, to the four walls of their office. They therefore limit the scope of their activity and the value of their influence.

The industrial leader owes it to his industry, to his community, to his nation to take an active part in all matters of public concern. By this I mean that it is his responsibility to take an active part in the social, the political and the economic life of his community.

Industry has been and is now burdened with legislation, commissioned or board control, excess taxes and various state and federal regulations. This has come about in part by some abuse of public interests by some industrial leaders, but no small amount of it is due to the policy of inactivity and of silence concerning public questions that has been pursued by leaders of industry. While the industrial leader has been pursuing a policy of inactivity and of silence, the soap box orator and his clan have been shouting to high heavens, demanding action. This element has prevailed more than we are willing to acknowledge. Result: legislative bodies composed of those not qualified, destructive legislation and burdensome boards of control or supervision. Have we any right to complain when it has been our inactivity that has sent poorly qualified and misinformed representatives to our legislative bodies. We deserve no better until we do better.

In recent months The Committee on the Elimination of Waste in Industries of The Federated American Engineering Societies has been intensively studying Waste in Industry. This study has clearly indicated that in some instances there should be a close co-operative working plan between inter-dependent and closely allied industries. For instance, there is no coordination between the paper and the printing industries. As a result a large waste occurs. It should be proper and possible for associations of paper manufacturers and of printers to have a means of coordination whereby the conditions now existing could be materially improved to the very great advantage of all concerned, the public, perhaps most of all. This form of co-operation has not been developed fully because of fear of state and federal legislation and control. If the public be informed of the facts, through a policy of publicity and of activity outside of industry on the part of industrial leaders, no such legislation is likely.

More co-operation and less competition is one of the needs of the hour. Thanks to wise leadership, a decided advance has been made. The time

was when a manager or an employee of a competitor's plant would be denied access to your plant. This narrowness still prevails in some quarters. There are many avenues of co-operation still closed. In the matter of costs, there is a tremendous opportunity for improvement, which would be beneficial to those in the industry and to those that purchase the commodity of the industry. Is it not the responsibility of the industrial leader to endeavor to secure the adoption of a standard cost system for his industry and to assist in the instruction of those competitors that have not been using an adequate system as to its use and the advantages of the same. In this alone, the industrial leader would render a large public service, for after all, it is the public that pays for all the ills that result from an inadequate cost system and the violent competition that frequently obtains because of it.

In the industrial leadership of America is some of the best organization and executive brains of the world. The performance of our leaders have caused the world to marvel. Yet the organization and control of our state and federal Governments are monuments of how it should not be done.

In recent months we have been told of the inadequacy, the wastefulness, and the inefficiency of the existing organization of the Federal Government. Mr. Hoover, in addressing the American Engineering Council in Philadelphia on April 1, gave this as an illustration of the conditions existing. He said of the mariner,

"He must obtain his domestic charts from the Department of Commerce, his foreign charts from the Navy Department, and his nautical almanac from the Naval Observatory, and he will, under some circumstances, get sailing directions from the Army. In a fog, he may get radio signals from both the Navy and Commerce, and listen to fog horns and look for lights and buoys provided him by Commerce; if he sinks his life is saved by the Treasury. He will anchor at the direction of the Army, who rely upon the Treasury to enforce their will. His boilers and lifeboats are inspected by the Department of Commerce; his crew certificated by one Bureau of Commerce, signed off in the presence of another and inspected at sailing by the Treasury and on arrival by the Department of Labor."

This is no exaggeration but a fair example of many such impossible conditions. The industrial leadership of this nation should make itself felt in bringing about a correction of this condition.

At the present moment, there is a splendid opportunity. Congress is giving consideration to a reorganization of the Government. It will need the advice and council of the best industrial organization brains. The industrial leaders should volunteer their services for this work which contains such great possibilities. The service that can be rendered is as large in its

possibilities as any phase of war work, for which so many of our leaders volunteered.

To bring about a reorganization that will mean the most to the nation will require that spirit of Honesty, of Courage and of Common Sense spoken of by Mr. Roosevelt. Many will be affected. There will be a probability that some will have to seek employment elsewhere. They and their friends will no doubt endeavor to influence Congress not to disturb their situation. Indeed there may be some propaganda to this end even now. Is it not within the province of the industrial leaders of this nation to give Congress that courage that will be required to execute this task by, solidly saying to the members thereof, we believe in applying the same principles for organization and of management to Government activities that have made this nation a great industrial unit. We shall be glad to put at your disposal all that we have that will enable you to construct a piece of Governmental machinery that will be the par of any nation and the equal of the best that industrial leadership has produced.

In so doing, industrial leaders would greatly benefit the nation and indirectly there would come a reflect favorable to industry.

We have indicated that the Federal Government is in a large degree a hodge-podge of bureaus and of departments. There has been no definite plan. The present machinery just grew as Topsy did. We wish now to remind you that industry itself is not free of such conditions. In many ways and in many instances, there is evidence of a state of hodge-podge. Things just grew. There is a total lack of economic standardization. One of the outstanding elements contributing to waste in industry today is the lack of standardization. The standardizing of procedure, methods and design is everywhere neglected.

In a given plant, 86½ percent of the annual production is invested in 8 models, yet some thirty-odd are produced. As low as only one of a given model is manufactured in a year. In this plant, the production schedule is largely based upon the 13½ per cent, with the resulting fluctuations in the number of people employed and the intensity with which the plant and equipment are used. In this plant alone, one can select a unit of product from 263,000 possible combinations.

The recent published report of the War Industries Board cites many examples of like character. Through the standardization of colors, together with certain restrictions in styles of sweaters and analogous articles, there was released 33% of the wool ordinarily used in that industry.

In the automobile tire industry, a reduction from 287 styles and sizes of tires to 32 was obtained. The number of sizes of steel plows was reduced from 312 to 76. Buggy axles from over 100 to 1.

These were war measures, but they are equally necessary now. It is of great importance that every possible economy be practiced in order that industry and business may soon approach more nearly pre-war conditions. This cannot become a fact until American products can be manufactured at a lower cost. While we do not believe in panaceas, yet we do say that standardization offers one splendid avenue of approach to lower costs. The American manufacturer or group of the same could meet foreign competition and enter foreign markets on a far more equable basis if there were a nearer approach to uniformity in the character, style and quality of the products being sold. Indeed some feel that the total lack of uniformity and of standards is one of the serious handicaps.

The whole question of standardization is of the utmost importance. It would be a proper function of the Federal Government to encourage co-operation and standardization and provide for fundamental investigation as to what may or may not be done in this direction. It is to be remembered that the greatest good can only obtain through co-operation and agreement which must be permitted and encouraged by the Federal Government.

To return to normal business conditions demands a reduction in costs. To return to normal as quickly as possible is of paramount importance. Indeed in this there may be involved as much as was in the winning of the war in so far as the stability of our national, industrial and commercial functions are concerned. One cannot look upon hundreds of thousands of idle men without grave concern. One cannot review the revolutionary conditions in Europe and the rumblings of the same in this country without apprehension. Such conditions cannot long exist without grave consequences resulting. The only solution we see is economic production and distribution. To bring this about is the responsibility of the industrial leader in co-operation with his financial and state and employee partners if you please. The avenues of approach are many. Perhaps the least fruitful of all is that of a reduction of wages. Surely an indiscriminate reduction of wages would be a very questionable approach. There has been a tendency on the part of some to attempt to solve the present conditions through a reduction of wages. Such a measure is only a make-shift. It is temporizing. There are more substantial, more remunerative and more lasting means of accomplishing the essential result of more economic production. The industrial leader that resorts to the temporary measure and does not analyze the problem and pursue the course that will lead to the substantial and permanent solution is not meeting his responsibility. Mind you, I do not say there should never be reduction of wages. There must be, but to do so and nothing more would not solve the problem, nor would it be the fair and the just thing to do.

One of the great problems of industry is to stabilize the production schedule. The great fluctuations in productive activity is the outstanding cause for the great waste occurring in industry. We have periods of intensive activity. When every possible person is employed, when the plants are operated day and night, when there is a large amount of overtime, when there is a scramble for materials and equipment, when everybody is making plant additions. Then suddenly the reverse conditions occur. Thousands out of employment, plants closed, material not moving, equipment idle.

It is these fluctuations that account for unemployment, restriction of output, labor agitation and a number of other industrial ills. To stabilize production, that is bring about a condition whereby there would be a more uniform flow of production throughout a series of years would within itself automatically eliminate many of the perplexing problems of present day industry. It is not easy of solution and it will require a full application of the spirit of Honesty, of Courage and of Common Sense. But we know of no more competent group to attack this problem than our industrial leaders. Many phases of the program lie entirely without the ordinary accepted realm of production. The factors of finance and of distribution are very important elements. This at once suggests that the industrial leader will have to deal with the banker fearlessly. Indeed, an entirely new point of view as to financing industrial activities may have to be developed. In fact, it will have to be. One of the reasons for the great fluctuations is the inadequate, not to say haphazard methods of financing now in vogue.

Another important factor is the present principles and policies of distribution. They too must be amended and altered so that a more even demand is made upon the productive units.

It may be necessary to classify and group certain industries and assign to them particular territory within which to operate.

The problem also will have to be studied on a world as well as a national basis. To consider the problem as purely national would be totally inadequate and would fail of its purpose.

The problem is too vast and varied in its ramifications to suggest a plan, but we do believe it capable of solution.

There is no need however of awaiting the development of a universal plan, for there is much that each plant and each industry may do. For example, there is little excuse for a number of so-called seasonal industries operating as such. Many industries that are now considered seasonal and that operate upon that basis could with comparative ease have a fairly uniform production schedule throughout the year. The advantages to accrue from such a policy would be many.

Some will say that such stabilization is impossible. But is it. What

could be more seasonal than the manufacture and sale of calendars. Yet the calendar industry has evolved a policy whereby it operates throughout the year.

The manufacturers of electric fan motors have studied their problem. They analyzed every phase of it. They considered the number of fan motors required in each region; they determined the period of demand in each region as effected by atmospheric conditions. They know fans are demanded in Texas in May and in New York in June. They manufacture, sell and distribute upon the basis of such an analysis. Thus they have stabilized the production schedule and manufacture of fan motors throughout the year. Many other examples might be cited.

In no other way could the industrial leader better serve his community than to set about to stabilize his production schedules. Thus he would furnish uniform instead of intermittent employment to the people; he would create a permanent personnel for himself and the community; the community would have a group of home-makers instead of a band of transients; the business and the social life and activity of the community would be more wholesome and more desirable. We shall not attempt to enumerate the advantages to be obtained by the industry as a result of such conditions. They are numerous and obvious.

Another very significant need is the creation of standard units of measurements for the various factors of management. In investigating waste in industry, we have endeavored to determine every factor quantitatively. We have sought units of measurements to apply, but have found none. The nearest approach to a standard unit of measurement and understanding, has been in determining the per cent of labor turn-over. However, in this there is no complete unanimity. Labor turn-over means one thing to one manager and quite a different idea is conveyed to another. The method of computing it varies materially and altogether no method is entirely satisfactory.

That there is no standard of measurement is a significant and at the same time a lamentable situation. How could business be conducted if there were no units of measurements of commodities, as yards, pounds, tons and dollars, to apply? Such units of measurements are absolutely essential. While management units of measurement may not seem to be so essential, yet until something is developed we shall never be able to intelligently compare the performance of any two organizations. And as the idea that the efforts of any organization should be evaluated in accordance with the public service it renders, grows and becomes a pronounced dictum on the part of the public,—standard units of measurement of the factors of management will become as essential as are the commercial and purely engineering units that we now have.

In conclusion, I wish to emphasize the responsibilities of the industrial leader by enumerating the factors.

Another unsolved management problem is the collection and codifying of valuable statistics. There is a large amount of most valuable information pertaining to every phase of management, hidden away in governmental, state, corporate and private files. In a large degree it is unobtainable, in many instances not wholly reliable and almost sure to be incomplete. In this lies a tremendous economic waste. Doubtless hundreds of thousands of dollars are spent annually by industry in securing information through research and otherwise, that is already in existence, that has been developed by somebody. There is a very urgent need for the development of some national plan whereby such information may be brought together, called, and edited, then distributed, the best to be had on any phase of management would be available. This may be done by a governmental agency, by an association of allied and inter-dependent manufacturers. It, however, should be done accurately and painstakingly. As stated, there is a large amount done now, but in most instances it is inaccurate, incomplete and not discriminating.

First—Apply the spirit of Honesty, of Courage and of Common Sense to his manifold problems.

Second—Adopt and adhere to the principle of publicity. Know the economic facts and give them to the employee and to the public.

Third—Devote time and effort to matters of community, state and national concern. From your treasure house of splendid training, ripe experience and accumulated knowledge give those needed values to your community, your state, your nation.

Fourth—To remove from industry many restrictions and burdens imposed by legislation and Board control. A greater statesmanship is needed in our legislative bodies. It is the responsibility of the industrial leader to interest himself as an intelligent citizen in securing such statesmanship.

Fifth—More broad-minded and constructive co-operation and less violent competition is a cause that the industrial leader must advance.

Sixth—Give to Congress your support, your experience, your effort to the end that the Federal Government may become the best organized and managed government of the world.

Seventh—To stimulate and support a movement whereby there may come about a greater standardization and stabilization of industry, the two factors that most largely contribute to industrial economy.

If the industrial leaders as a group would address themselves to these tasks they would indeed accomplish great good and would merit and surely obtain the cordial support and approval of all right thinking people.

THE CHAIRMAN: I have the pleasure now of presenting to you our good friend, a man I love to speak of and always think of as the Dean of the industrial engineering profession—Mr. Harrington Emerson.

“THE PRINCIPLES UPON WHICH INDUSTRIAL LEADERSHIP
RESTS”

HARRINGTON EMERSON

Director The Emerson Engineers, New York

A few years ago I was visiting a friend whose wife was very intense and very anxious to improve herself, taking an interest in all questions and particularly in literature. There were books in her parlor, books in her dining-room, books in the bedroom, books in the kitchen, and as she worked in her kitchen she would have an open book before her and study it as she washed or dried the dishes, and if she saw any reference that she did not understand, she immediately went to the library and there she would spend an afternoon studying up the subject. And what seemed to me a great pity was that with all that study she didn't seem to get anywhere. If she had been taught, or if she had studied a single gem of literature, she would have found out the principles on which literature rests and it would not have been necessary for her to have read countless books, most of them better unread.

About twenty years ago I was up in the Artic regions among the Eskimos. They have a good deal of gift in embroidering and in adorning tanned skins and I gave to an Eskimo woman three letters to embroider on a skin. I cut them myself out of pasteboard for her and showed her what the middle letter was. The three letters were—“F. J. Q.”—they were the initials of a friend to whom I wished to present this skin. I expected her to put them in the upper right hand corner of the hair side.

I supposed, of course, that she would place those three letters of F. J. Q. in that order, and when they came back to me I found they hadn't been placed right. That lead me to find out how many different ways you could place F. J. Q. and still have “J” the middle letter and the other three in line, and in the right corner and I discovered the number was 16,384, and that was the chance she had of getting them right when I simply gave her the three letters and told her that “J” was the middle letter.

You can imagine what a tremendous achievement it has been for us in our reading, to learn that we read from left to right, and that our words are to be on a line and that the letters are always to stand on their feet and not on their heads, and that they are to always face from left to right and not from right to left. That is one of the things that has helped us enormously

in such an important thing as teaching little children to learn to read. It isn't obvious that we should learn to read in that manner because the Hebrews read from right to left and the Japanese read from the top down, and when we add figures we add from the bottom up, so any one of those four ways might be a satisfactory way but because we have learned to read in one direction, on one line, with letters in one way, we have simplified the whole problem down to one-sixteenth-thousandth of what it might have been.

That illustrates what I mean in principles. Professor Einstein says that the progress of many means that from a few principles many results flow, and the more you know, the fewer of the principles and the more flows from them. So it simplifies immensely our task in life in acquiring knowledge to find out what the few principles are, to adhere to those and to tie into those, and they will cover nearly everything else.

In this matter of the principles upon which industrial leadership rests, I have picked out four qualities that have pertained to all leaders—not only industrial leaders, because a man cannot be an industrial leader and not naturally a leader also, and therefore I pick out the principles that cover all leadership.

To begin with, before we come to those particular qualities that should pertain to any industrial leadership—the first of all I place character. Dr. Frank Crane recently spoke of dependability. That is another word included in what I mean by character. It is that quality that makes us trust a man, know that he will be there, or a woman, and know that she will be there and we can count on her.

At one time somebody asked J. Pierpont Morgan whether he didn't loan on collateral, whether he didn't insist on having the right collateral before he would make any advance to a man. He said, "No sir. There are men to whom I would lend a million dollars without a scrap of paper, and there are other men to whom I wouldn't lend five cents on the collateral of a million dollars—what I loan on is character, not collateral."

The next quality that is necessary for leadership, and always has been necessary for leadership, is competence. A man must be competent. It isn't sufficient to have good character. I have seen babies only a few days old who had a great deal of character but the babies as yet had no competence. So you have to back up the character with ability, with competence.

There is a story of the time when they were raising one of the obelisks in Rome, I think the great obelisk in front of St. Peters, and the Pope gave orders that no man should speak, no noise should be made as this obelisk was drawn up from its recumbent position to its upright position. The crowd assembled and the ropes stretched and it reached the point where the

obelisk couldn't go any further—there was no stretch in the rope. Suddenly a man called out—"Wet the ropes," and they poured water on the ropes and that made them shrink and it drew the obelisk up. It makes no difference to me whether the story is true or not, that man had competence. Let us also say that he had courage and character, but at least he had competence. He was the man of the hour and therefore he, the unknown sailor, at the moment became the leader—the head of all the engineers and everyone else in charge.

The third great quality is that of courage, of energy, of initiative. A man may have both character and competence but if he doesn't have courage, it amounts to nothing. He must be willing to go ahead, to do and to dare, and one of the little stories that I have always given as an illustration of courage is the story of the Irishman who fell out of the eighth story of a building on which he was working. One would suppose that that would be about the end of things, but not for him. As he was falling, he saw a plank sticking out and he grasped the plank the plank broke and came tumbling down with him. Three stories below that he fell on another plank, that broke, and finally he landed down on the ground below and was able to pick himself up and even walk to the hospital and was out in a couple of days. That man had courage. He didn't lose sight of the essentials even though he was falling down from the building.

I remember another story of a sailor on a little lumber schooner off Cape May that was wrecked and for about twenty-four hours he clung to a plank, driven by the sea and lashed by the waves until finally he was cast up at Coney Island and brought back to life. That man also had what I call courage.

And finally we come to the fourth quality that I particularly wish to mention because it is the one that Americans mostly underrate. It is the quality of charm, the quality of tact. You may have the character, you may have the competence, you may have all the courage, but if you do not have the ability to make the other people willing to follow, it is all for no purpose.

One of my assistants once said to me—"Men in a shop will not do what you ask them to do because it is right, because it is easy or because you pay them money to do that work—they will not do that for any rational reason except that they like you, and they will not like you unless first you like them."

That is also what I mean when I say that tact is the fourth principle upon which leadership rests. I remember a story which occurred in "Punch" many years ago, of a little girl being taken to account by her governess because she was naughty and was told that if she was not a better

little girl she was not going to heaven. And the picture showed a rather severe-looking grandmother in the corner and a cross aunt, and this little girl said, "Will granny be there?" "Yes, granny will be in heaven." "Will aunty be there?" "Yes, certainly aunty will be in heaven." "Then, if you please I think I would rather go to the dogs with papa." Papa may have had no character, he may have had no competence, he may have had no courage, but I am quite certain that papa had charm.

Perhaps the most striking thing that we can speak of in history to illustrate most those four qualities is that girl who was recently canonized by the Catholic church as an example and model to us of all times—the maid of Orleans, who certainly showed charm, showed competence showed courage and showed character; who started out I believe at the age of sixteen and perished at the stake at the age of nineteen.

Passing on to industrial leadership, the qualities that are needed must, of course, rest on these four qualities that I have given to you, but there must be something more in addition.

The peculiarity of man I have thought for a long time is perversity. He differs from other animals in that particular direction. You can count on what an animal is going to do, upon what a tree is going to do, but you cannot count upon what man is going to do. Men swing further away from the middle path than any other animal, and what is peculiar about them is that they will swing about in the wrong direction. If there are four ways of doing a thing of which three are right and one is wrong, you can count on a man choosing the wrong way three times out of four. You may smile, but that is unfortunately true—he does not seem to have a peculiar faculty of choosing the right path. We know that the dog's great instinct is to cooperate, and that is what makes him so tremendously valuable. He may know more than you do, but is perfectly willing to put his knowledge at your service. And the horse, he is willing to be guided—he doesn't cooperate in the same way as does the dog, but he is willing to obey, to be guided, to place his weight and strength at your disposal. But when it comes to man, he doesn't always want to cooperate and he doesn't always want to be guided and he is just as likely as not to go off in the wrong direction.

There is no quality, however, that he has that enables us to keep him straight. You give a man a standard, an ideal, and persuade him that it is worth while and he goes after it with an intensity that is absolutely unexampled.

Take such a question as time: one of the most absolute, unvarying standards is that of star time. The moment man conceived the idea of star time, he wanted to build a machine that would register it, and through

2,000 years, perhaps 6,000 he did not rest until he produced the modern watch whose balance wheel vibrations do not vary more than the millionth part of a second.

I have heard that Roland ruled 200,000 lines to the inch. A man whose business it was to make engravings for photos was ruling about 300 lines to the inch, but when he heard that Roland had succeeded in ruling 200,000 lines to the inch, he resolved that he would beat Roland and he said after he had once started he forgot all about Roland and the only thing he wanted to do was to rule that rating as finely as it was possible for human skill to rule it, and he succeeded in ruling engravings to over 1,000,000 lines to the inch—not exactly, but 999,000 in one and perhaps 1,017,000 in another, but practically he could tell you the number of lines ruled there and his engravings were up to 1,000,000 lines to the inch. What the utility of ruling an engraving to a million lines to the inch I do not know, but that is always true of humanity—get a man started on some ideal and there is no need of its being sensible—that isn't necessary at all.

Why should a man spend his life shooting at clay pigeons in order to break 1,000 clay pigeons in succession? Yet he will do it. The moment you give any man an ideal, it is very much like the tracks of the railroad. We put a locomotive on the tracks—what are they there for? To keep that locomotive from running off into the ditch, and it would do it immediately if it were not for the tracks, and so it is with the man—if you give him a lot of track to run on and put some steam behind him, he will keep on the tracks.

One of the ways to keep men on the tracks and to make them industrial leaders is, as Mr. Wallace said in his address, to give them standards. That is what I have found in my own experience to be so often lacking. The moment a man has standards, he immediately begins to live up to them; he immediately acquires the technique that is necessary to attain the standard and that is a tremendously important matter, this possibility of getting the technique that gives you the standards.

Suddenly, out of the corner of my eye, I am reminded that I have omitted one of the illustrations I was going to use. Mr. Taylor, you know, a number of years ago started out with time studies and we all thought time studies were a very excellent matter and we all had our time watches and we made any number of studies of how long it took to do this and the other thing, down to seconds, and most of us were fairly content with time studies. But along comes a slender young man who said that time studies were all wrong—they didn't get you anywhere even down to the thousandth part of the second—and the movement—motion study, was the thing that counted; that was the real, accurate thing, and time study was just like

those 200,000 rulings of Roland—they didn't count any more. Now, anybody that wants to be in the swim has to forget about time studies. I haven't taken my time watch out of its desk for two years since I heard about motion study, and that's the way with the rest of us—we are all forgetting at the present time about time studies because we know they have been superseded by something that is very much more accurate.

Coming back to the question of standards and of technique, the moment you give a man a standard, he will develop the technique to achieve it.

Recently I have been making a study of the railroad operation in the United States, and what strikes me particularly is the absence of standards in railroad operation. Wherever there is a standard, there is tremendous excellence. For instance, there is a standard that the tracks shall be four feet, eight and one-half inches apart, and the tracks all over the country are four feet, eight and one-half inches apart and you can take a car and run it through any part of the United States—freight cars, passenger cars and locomotives, and you will always find the tracks four feet, eight and one-half inches apart. And they have a standard grade and curvature.

Another matter which they have standardized is that of the great time tables and some of the railroads obtain a standard of 99% perfection on a time table on some of their trains. To leave New York exactly on the second and arrive in Chicago, one thousand miles away, exactly on the second, is a very, very great thing and shows the ability of the individual to follow a standard.

Everyone has gone ahead with that proclivity of the human mind to go astray and the consequence is that you have all sorts of tremendous apparitions. One is that in starting a railroad you would figure that there must be some standard that you could safely set as to the amount you could invest. The locomotive, for instance, what does it do? It is the thing that earns the money for you. How much can you afford to put into each locomotive that you are going to keep busy? Certainly a man who starts up a taxi cab service in some city is going to figure on the volume of business he will do on each taxi cab—so many taxi cabs, so much earning, and so much expense, and is it going to pay. One would suppose that would be the basis. In fact, when you come to investigate, you find that different men engaged in railroad operations have invested from \$33,000 for each locomotive and road equipment up to \$9,247,000. Evidently the people who invested \$9,000,000 for each locomotive to keep busy had no standard to go by, and you find rates varying from one-half cent a ton mile up to \$1.43 a ton mile, and in every other matter you will find the same variation.

We find that it costs to operate a locomotive on certain railroads from \$200 to \$250 for all expenses, including the cost of operation and invest-

ment, and you find on other lines that costs over \$4,000 a day to operate a locomotive; and we find that on some lines the earnings are \$2,000 a day and on this line where they spent \$4,000 a day to operate, the earnings were only \$199.

The railroads of the United States you might say could be put into four classes, and as to each one of those four classes there have never been any standards and that is the reason that variations have occurred—simply because the standards have not been set and there was no evolution of technique to meet the standards.

There are those railroads where they have a large amount invested and have great skill in their working force and the rates are so low it is impossible for them to operate. That is one class. There is a second class where the railroad is well operated but there is not enough business to pay for a railroad in that particular locality. There is very little help for either of those two classes.

There is a third class in which so much has been invested that notwithstanding the fact there is a good deal of business at a fair rate, they cannot earn enough even on the business they have at the fair rate to pay the tremendous investment cost. And finally, we come to the fourth class where the operating expenses are higher than they ought to be, higher than the standard, higher than the technique would develop.

Finally, I would say about the industrial leader that he must have the four qualities I referred to, he must know as to industry itself that there are standards and technique that he must apply, and finally, he must be convinced of a fact that is very often forgotten. I have often dated the beginning of modern industrial investigation from the determination of the mechanical equivalent of heat. About the year 1840, when it was found out that we could convert foot-pounds into degrees of heat, that 775 or 776 foot-pounds were the same as the amount of heat that was required to heat one pound of water one degree Fahrenheit, we brought in a standard that up to that time had not existed.

Slightly earlier than that, a man in England evolved a treadmill. He said when a man was condemned to hard labor it was not to find what the hard labor meant, that that was an indefinite term, and he, having an exact mind, felt that hard labor ought to be something exceedingly difficult so that if a man was condemned to work on a treadmill for a month, six months, or a year, you had an exact measure of the hard labor that he ought to do and it made no difference whether the man was small or heavy, each man in proportion to his weight had to climb so many feet a day. I think the number of feet climbed was something like 9,740 which was considered a day's work. A man had to lift himself to that and he couldn't get out of it.

He suggested that they should use this power generated by man to pump water, or to do some other useful work, and the moment they did that they found that the cost of public water mounted to \$1300 a year per horse power—that a mule on the treadmill was worth a good deal more than the human being. And from that time on we gradually began to realize that man was no longer a beast of burden to be compared and put on the same plane with the mule, but that he had a different function in the universe. Men should be convinced of that fact.

Recently I checked up what a Chinese coolie was able to do compared with what the American railroad was able to do, and I found the Chinese coolie was able to move a ton mile in a day. That is, he carried 100 pounds 20 miles and he received 10 cents for it. In an American railroad we say to the man, "We don't want you to compete with that Chinaman—we know that only a couple of hundred years ago men worked in England in the same way they do in China today, by the mere sweat of their brows and muscles of their backs—but here is \$10,000 worth of equipment (that is the average of equipment that is given to each worker on the railroad) and here, in addition, is from two to three thousand dollars worth of material. We expect you to supervise that \$10,000 worth of equipment and that two or three thousand dollars worth of material—see what you can do." And when you do that and credit to the man merely his part of it, you find that combination is moving about 500 ton miles per day instead of one ton mile; that it is moving it at one cent instead of ten cents, and you find the man himself is to receive credit for between 150 and 160 tons. In other words, he does 160 times as much as the Chinaman is able to do and he receives 50 times as much pay. That is because we have realized that the man is no longer to be measured in foot pounds against the mule or the horse, but is to be measured against the human quality, the human ability to supervise, to direct, and to that there is absolutely no limit.

It would be possible, I believe, at the present state of things, for two men to take a 10,000 pound vessel across the Atlantic from port to port—a matter of supervision and not a matter of strength.

Unfortunately at the present time the world over, in railroad agreements and elsewhere, you find that old fallacy still lingering that the man is to be measured by foot pounds instead of by ability, and I remember only a day or two ago that this was put up to the Industrial Board—that no railroad president should be permitted to draw a salary of ten or fifteen thousand dollars a year—they thought that was wasteful, that no railroad could afford to pay that. All that I can think of is this—that if in the year 1914 there had been any man that had the character, the competence, the

courage and the tact to stop the World War, two hundred billion dollars would have been a cheap reward for that kind of service. (Applause)

CHAIRMAN: Our next speaker is Mr. Edward T. Miller, Secretary of the United Typothetae of America, who will talk on "The Qualities of the Industrial Leader."

"THE QUALITIES OF THE INDUSTRIAL LEADER"

EDWARD T. MILLER

Secretary, United Typothetae of America

The foregoing addresses clearly set forth the Responsibilities and Principles of Industrial Leadership. The province of the present speaker is to enumerate and illustrate the **Qualities** which characterize and are essential to an **Industrial Leader**.

Reducing the topic to its "definition of terms," we find that **Quality** is "that determinateness which is one with the being of the object," and that a **Leader** is one who precedes and is followed by others in conduct, opinion and undertaking, or is one having authority to precede and direct. Therefore the **Qualities** of a **Leader** are those "determinatenesses which are one with the being" of the person, who having the authority to precede and direct, is followed by others in conduct, opinion, undertaking, action or movement.

The fundamental principles of leadership are the same for every sphere of human endeavor, consequently our various kinds of leaders employ the same fundamental qualities. The Political leader, the Military leader, the Industrial leader, all are dependent for success and mastery upon the same fundamental qualities, though each may differ from the others in the kind and degree of technical knowledge required in their specific enterprises.

Inasmuch as another will discuss the qualities of an industrial executive, no attention will here be paid to the parenthetical question used in connection with the main topic, chiefly because it is the speaker's conviction that the term "Industrial Leader" is not synonymous with "Industrial Executive." A **Leader** may be an **Executive** in the sense of setting his plans in motion and attaining his objects, but an **Executive** may not necessarily be a **Leader**, though the **Executives** of today are the potential **Leaders** of tomorrow.

In an analytical study of Leadership, I find two groups of attributes. The first group embraces the attributes of **preparation**; the second the attributes of **production**. All leadership embraces first the vision, the survey, the planning, the preparation; second, the building, the realization, the accomplishment, the attainment, the production. Measuring Leader-

ship with these two main groups in mind, we find under the first group:

Leadership is **Prospective** and not retrospective; it is forward looking and not backward looking; that the leader is like the locomotive driver and not like the person on the rear platform.

Next Leadership is **Attractive** rather than repellant—that it brings together men and things, preparatory to the execution of the prospective designs.

Under the second group we find:

Leadership is **Constructive** rather than destructive it builds towards the permanent rather than the temporary, always towards betterment.

Lastly, Leadership is **Operative**; it maintains and operates what it has planned and constructed.

Briefly, therefore, real Leadership consists of (1) the ability to see and plan the future; (2) to draw around one, men and things with which (3) to build, and having once builded, (4) to maintain and preserve, to produce the appropriate or designed effect.

Having determined the characteristics or attributes of leadership, let us now examine, enumerate and illustrate the **Qualities** of the **Leader**; let us search out those qualities which are "one with the being" of the Leader. And as we set down these **Qualities**, shall we not arrange them under the four attributes—**Prospective, Attractive, Constructive and Operative**:

That attribute of Leadership which is Prospective calls for such Qualities in a Leader as Vision, Comprehension, Imagination, ability to Plan and Dream, Recognition of Opportunity. It has been truly said, "All the leaders in the world's life have been men of imagination." The architect first sees the cathedral with his mind's eye; a Rhodes or a Hill first comprehends the potentialities of a continent before he builds his railroad; a McCormick recognizes in the vast acres of a Dakota the opportunity for farm machinery; a Field first dreams of linking continents together with cable. These great Industrial leaders, like thousands before and after them, first dreamed their dream, first imagined the future design, first saw the vision of great accomplishments, first had the courage of faith and recognized opportunity to serve mankind. No man has led others who first has not seen in his mind's eye the goal toward which he strove. No man has shaped the world's events who first has not caught the Promethean flashes. Let him who would be a leader keep an open mind; let him have a broad vision; let him see this world illuminated by the effulgence of the Golden Rule, and let him have the faith by which mountains are

removed. Call these Qualities what you will, enumerate and differentiate them more fully, but they must be the "determinatenesses which are one with the being" of the Industrial Leader.

But to dream and plan alone is not leadership. The **Attractive** attribute of leadership embraces those qualities that enable the leader, by influence of a moral or emotional kind, to draw about him for the accomplishment of his designs, and to gather the things needful for his purposes. Andrew Carnegie had a remarkable faculty of surrounding himself with able captains. Simply enumerated these qualities are strong personality, wisdom, judgment, character, righteousness, justice, understanding, discrimination. He that would be a leader must cultivate, train, and discipline all of these qualities to such an extent that he may use them as agencies in gathering about him the sinews with which he expects to execute the plans of his dream, just as a general gathers about him the accoutrements and implements of war before undertaking his campaign. It is sometimes said that some men are natural born leaders. If this be so, it is because they have bred in them these qualities in a more or less highly developed stage.

The natural requisite to a strong personality is a fit body. Cultivation of the graces and charms of gentility, courtesy, generosity, hospitality, tolerance, and unselfishness cannot but add to the strength of personality. The very embodiment of all these are in the saying of a Great Leader: "For as much as ye did it unto one of the least of these, ye did it unto me." In the very charm of personality is strength, and by the strength of personality men are drawn to the leader possessing it.

Wisdom and judgment and understanding! Qualities recognized as essential since the days of Solomon who in the Proverbs penned for his people declared: "Happy is the man that findeth wisdom, and the man that getteth understanding; for the merchandise of it is better than the merchandise of silver, and the gain thereof than fine gold." And again, "Doth not wisdom cry? and understanding put forth her voice? . . . Unto you, O men, I call; and my voice is to the sons of man." If a leader of men, an industrial leader, if you please, would draw men to him that he may use them in the great industrial armies of the day, let him open his heart to all the great forces for industrial betterment, to a fuller understanding of the human element and its relations in industrial affairs, to the end that he may employ them with understanding, with wisdom, with judgment. Then will his righteousness and justice appeal to men and they will enlist under his banner. To the qualities of the **Prospective** add the qualities of the **Attractive** and make them one with the being of the Industrial Leader.

Chief among the Qualities of the Leader embraced in the Constructive

attributes of leadership certainly must be a thorough understanding of the fundamentals and processes of the industry the Leader is called upon to conduct. Here is where the technically trained man enters. He must be a man who **knows**. Remember the old Arabic proverb, "The man that knows and knows that he knows, he is a leader, follow him." He usually has the ability to distinguish between opinion and fact; consequently he is more interested in principles than in methods and believes that if the principles are right the results will take care of themselves. Lincoln always insisted on the "main idea" and left to his Cabinet the details to be worked out. He knew what he wanted and that on only right principles could he hope to obtain the results he sought.

Another constructive quality is initiative. There must be the great urge present in the heart of the Leader. Originality is akin to individuality and is a distinguishing kind of quality. Our Industrial Leaders may well draw lessons of great benefit from the successes of the world's great military leaders.

The qualities of progressiveness and adaptability in the constructive attribute are the complements of vision and comprehension. The man who can look into the future, must also be progressive enough to strive for the goal. Pershing did not hesitate to utilize to the fullest extent all the tested contrivances of Commerce and Industry in his military effort to break Germany.

Two distinguishing qualities of constructive attributes are directive-ness and concentration. The leader must make no false moves—he must be sure of his directions; he must have the ability to center all the powers of his being on the thing that is to be done. Grant focused Richmond and fought it out on that line. Edison shuts himself in his laboratory when he is working out some great experiment, denying himself sleep and food.

Confidence in his own powers is a constructive quality which wins. Pizarro, the Spanish adventurer, drew a line on the sand and declared, "Friends and comrades, on that side are toil, hunger, nakedness, the drenching storm, desertion and death; on this side, ease and pleasure. There lies Peru with its riches; here Panama and its poverty. Choose, each man what best becomes a Castilian. For my part, I go to the South." As he stepped across the line, all his followers followed him. "Belief in the thing in hand makes mightily for success." Many an Industrial Leader has carried his men with him by a display of his supreme confidence of what is the right course.

Enthusiasm is contagious and inspires builders. Self-control or self-mastery is taught at our military training schools on the theory that you cannot control others until you first control yourself. This is absolutely

essential in leaders. The very motives of the Leader are a source of strength in constructive leadership. Co-operation as distinguished from selfishness insures the teamwork necessary in industrial leadership. The trade associations of the day have contributed largely to this very important phase of industrial leadership. And last of all is will power, the energy behind all of the other qualities of constructive leadership.

It is in the Constructive qualities of leadership that Executive ability manifests itself most largely, though it is equally present in the Operative qualities. Someone has said of the characteristics of man that he is either mental or manual, either directive or dependent, either of large scope or small scope, either deliberative or impulsive, either dynamic or static, either mentally accurate or mentally inaccurate, either progressive or settled, either original or imitative, either adaptable or self centered, has either endurance or lack of endurance, has either rapid mental co-ordination or slow mental co-ordination, possesses either concentration or diffusion. If a man possesses eight of these favorable characteristics out of the twelve he is said to be a pretty fair executive. Some of these characteristics will be recognized as qualities of leadership mentioned and illustrated above.

But it is not enough that one should plan industrial enterprises, gather about him the men and materials with which to build and even consummate the plans. After the structure is completed, it must be maintained, and maintenance requires as much Leadership and as great leaders as the three preceding stages. The **Operative** attributes of leadership require all the qualities that have been enumerated above. There still must be vision, strong personality, concentration, will power, technical knowledge, and to them may be added the qualities of even-temper, ability to harmonize, to co-ordinate, to adjust, faith in the work and confidence in the ultimate righteousness of it. I have known some Industrial Leaders who could plan and even organize great enterprises but who seemed to be utterly impotent when it came to operating them, to attaining the objects for which the enterprises were brought into being. They seemed to lack the power of co-ordinating the several activities and therefore failed to attain the ultimate ends. Herbert Hoover is a remarkable example of a leader with tremendous powers of co-ordination—of meshing the gears of a score of enterprises so that maximum results are obtained.

Before closing, I cannot resist the opportunity of bringing to your attention the tremendous benefit Industry is deriving from the unselfish work of those Industrial Leaders who through Trade Associations and Commercial Associations are arousing employers to their responsibilities to themselves, to each other, to their industries and to the nation. Consideration of the human element which today is so pronounced has been

brought about largely through the agencies of the Trade Associations Apprenticeship, and foremen training and other vocational education have been fostered. Accounting systems have been improved, trade customs refined, and collective advertising most successfully conducted by these Associations. Our schools and colleges can and will do more and more toward vocational education, but there comes a point where the industries themselves must step in and do their part. So I say, all honor to those Industrial Leaders who today have visions of the great future and are striving by their personal efforts to pave the way by Trade Association work and otherwise, to happier times ahead.

The leader with the right qualities, by his own buoyancy, will come to the top; he cannot be kept down. Let his be the ringing note of encouragement to all our young executives who, as I have previously remarked, are the potential Industrial Leaders of tomorrow. Let them cultivate all the qualities possible in the four groups mentioned, and when their garden has grown and blossomed and borne its fruit, there will be joy and happiness in Leadership and blessedness and glory in Service to all Mankind.

ADJOURNMENT

DINNER MEETING AT HOTEL PFISTER
Wednesday Evening, April 27, 1921

Arranged by the Ladies' Entertainment Committee
Chairman: MISS MILDRED T. SMITH
Holeproof Hosiery Company, Milwaukee

"FATIGUE STUDY AND THE HOME"

LILLIAN M. GILBRETH
Honorary Member of S. I. E.
Montclair, N. J.

The home presents the most complicated and the most interesting of all modern problems; therefore, Fatigue Study is more important in the home than anywhere else. Efficient running of the home implies the art of home keeping and the science of housekeeping, and Fatigue Study affects both.

The home is a plant, whose products are happiness, minutes and efficient citizenship. It is a restaurant, a dormitory, a school, a hospital, a gymnasium, a playground, and a factory,—and in it must be solved all the problems that affect these, as well as its own peculiar problems. Just as in the industries we have gained valuable results by transferring skill and successes from one field to another, by looking for likenesses, and by utilizing the experiences of others, so in the home we should look for likenesses to the industries, whose work the home parallels, and transfer methods that have proved their success in the industries to this oldest yet newest of industrial fields.

Fatigue Study has proved its value in the industries. The division of unnecessary from necessary Fatigue; the relief of high priced workers by assigning all but their highest priced motions to others; the introduction of rest periods; the emphasis upon the importance of working part of the time standing and part of the time sitting; the introduction of convenient work places, chairs and desks, correct posture and right clothing; the realization of the importance of habit,—these have all demonstrated their value in the industries.

It is our task here to show the application of these methods of Fatigue Study to the home.

Industrial efficiency does not necessarily mean doing away with fa-

tigue. It does eliminate unnecessary fatigue. Efficient house-keeping requires the expenditure of much energy. It is probable that the methods of household management can be so much improved that much energy that is now expended in the home can profitably be directed into other channels; but so long as the home exists it must have first claim on sufficient energy to create and maintain its efficiency,—and Fatigue Study in the home must have as its main product conserving and maintaining the home itself.

The first problem is, then, to determine exactly what are the essentials for an efficient home and to see that sufficient energy to maintain these is forthcoming. The sources of such energy are constantly changing. The human energy available is decreasing thru the complications of the labor problem. But the energy available thru the machinery and devices at the command of the homekeeper is constantly increasing. A large element of unnecessary fatigue in the home today, is that caused by failure to use all such available and easily procurable home equipment.

The home has no more right than has the industries to demand of the members of the organization,—which in the case of the home are the inmates,—more energy than can be compensated for with the available rest. If such energy is demanded or expended, the efficiency of the home must decrease exactly as does the efficiency of the plant in the industries.

Having determined the essentials, or the justified demands of the home, and the amount of energy that must be expended to satisfy these, we have next the assignment of work. We find a rule that has proved practical in the industries most useful here. The high priced worker should be relieved, as far as possible, from all work except that at which he is most skilled. This means, in the home, that the breadwinner of the family should, as far as possible, be relieved absolutely of home duties or any participation in the activities of the home, except such as he can do better than can others or such as will furnish a rest from the activities of the bread-winning occupation. The value of this rule is usually recognized when the bread winner is a man. Unfortunately, when the bread-winner is a woman, the importance of the same rule is usually underestimated. The wage-earning mother, daughter, or sister who contributes to the family maintenance, has a right to full efficiency for the wage-earning occupation, and should not be expected, except in an emergency, to be a member of the working force within the home. Rest and relaxation, within the home or without, during non-working hours are not only the right of the wage-earning individual, but a factor in the efficiency and best interests of the family, and should be so recognized.

Within the household, also, the more skilled members should be relieved by the less skilled wherever possible, not only as adding to the effi-

ciency of the skilled worker, but as a method of training the unskilled.

Work periods and related rest periods, which have proved so profitable in the industries, can also profitably be used in the home. It is true that the activities of the household are so varied and extend over so many hours, that it is more often possible to arrange a schedule that will permit change of posture, exercise and rest than in the average occupation in the plant. We must remember, however, that change of occupation is not necessarily restful, and is apt to be extremely unpleasant to certain types whose "warming-up period" is long, and concentration strong. We must remember, also, that the nervous strain incident to caring for small children, the lack of opportunities for sociability and consequent relaxation; the constant necessity for rearranging and adjusting a program which must be extremely flexible,—these and other factors which may call for consideration in individual homes make a complicated problem. This is not to deprecate in the least the splendid work of individuals and of the Home Economics Departments in the various colleges on the problems of the household. It is to bring before this group of industrial engineers the complexity of the whole problem and the need for the application of the best that engineers, psychologists, physiologists, and other scientists have to give.

A certain amount of absolute rest, not only after the day's work, but during the day's work is essential. This rest may be most easily and quickly taken reclining absolutely flat with no pillow. A short rest period before one is overtired, will do more than a much longer rest period when over fatigue has actually occurred. Mental rest as well as physical rest is essential. This latter results far more often than we think from a restful physical attitude.

We turn next to the work place and the rest place. The home should furnish a work place for every member of the household, both adults and children. Tho the home is usually rather a rest and recreation place than workplace for the men of the household, there are individual cases where it is workplace for the men as well as for the women, at least part of the time. An efficient workplace need not necessarily be large, but it must furnish the essentials for the type of work to be done. Proper heat, ventilation,—these are always essential. Equipment either in place or easily available, that there may be the least time expended to "get ready" for work and "clean up" after it; provision for proper posture, and rest and work intervals where the work is to extend over any length of time;—these are the rights of the worker in the household as in the plant.

In the case of the women of the household the home usually is the workplace for many hours of every day. They have, therefore, the right to demand what the workers in an efficient organization would receive, i. e.,

an opportunity to produce the most output with the least expenditure of energy and fatigue. The children, also, have the right,—a not always recognized right,—to an efficient workplace, both for performing their home activities and for the “home-work” that is usually a supplement to the school work. The essentials for their tasks must be considered, and the means for performing them efficiently provided; a workplace available and ready, equipment available and ready, quiet, and the incentive or motivation that is a part of successful work.

The rest place must receive the same attention as the workplace, and must be ready and available for each member of the household. Perhaps it is not amiss to emphasize the fact here that mental as well as physical rest is needed, and that the book, the magazine or the paper that will interest and at the same time rest, each member of the household, should be as available and ready as is the chair or couch which forms part of the rest equipment.

We turn next to a consideration of this chair, which in the industries, has received more attention than has any other fatigue eliminating device. The efficient workplace for long continued operations provides for performing the work part of the time standing and part of the time sitting. This means that the user of this workplace is provided with a desk, table or workbench which comes approximately to his elbows when he is standing. He is then provided with a chair which allows him to sit at the same relative height to his workbench or table. This chair should have a foot rest of appropriate height and be on castors that will allow its user to pull it into place or push it aside with the least expenditure of effort and time possible. The desk can profitably be cross-sectioned, the lines being four inches apart, to be a constant reminder to study the effects on output and fatigue of that great source of free wealth and fatigue elimination. The arrangement of the work upon the workplace furnishes another problem, but when the most satisfactory arrangement, for the time being at least, has been found, a drawing of this arrangement upon cross-sectioned paper, corresponding to the cross sections of the workplace, will enable the user to maintain this arrangement. If the One Best Way of performing the work is kept in mind as the goal, the improvements will follow naturally and be of permanent value.

Posture is equally important in the home and in the industries. So much has been done by the Posture League on this subject, and their literature and charts can be used to such advantage in the school and in the home, that the practical applications of eliminating fatigue thru correct posture are easy. The League studies of posture at work are being supplemented with studies of posture at recreation and posture at rest, and the chair and clothing are receiving equal consideration.

The question of clothing, so important in fatigue study in the industries, is a subject demanding special attention in the home, which is the best field for experiment along these lines, for this reason, the plant serves as social center as well as workplace for many members of the community, especially for women. Consequently, it is difficult to insist that clothing appropriate for work be worn during work periods, as it is not practical that this clothing be changed for what the workers, at least, feel is clothing appropriate for social relaxation during the rest or recreation periods. In the home, facilities for changing are at hand, and there is no excuse for not wearing appropriate work clothes during work periods, and indulging in satisfying clothing and shoes during the rest, relaxation and recreation periods. "Appropriateness," that test for clothing, may well be supplemented by the phrase "from the fatigue standpoint." During the work period, to be appropriate the clothing must have fatigue elimination its main object and aim, at least, not to cause any unnecessary fatigue. On the other hand, during the rest period or recreation period, clothing may be appropriate and at the same time leave as its direct product giving pleasure to the wearer, for any fatigue that this clothing causes during the short period of relaxation will be more than compensated for by the satisfaction which results from its wear.

The amount of time consumed and the difficulties of putting on, adjusting and taking off clothing, is an important element in the fatigue produced. Work clothing, especially that which is adjusted and taken off at the plant must be easily put on and taken off. Fatigue elimination can profitably be held in mind in the design of all clothing. Easily adjusted clothing for the adult is important, but not so important as easily adjusted clothing for the child. Garments that the child can put on and off himself, with the least time and with the least effort, not only mean relieving an older person from unnecessary work, but also training the child to be **dexterous** and finally **skilled** in his motions. This training is a valuable part of the Montessori System, and much of this system can be profitably and easily carried out in the home by keeping this thought in mind when clothing is designed and made or bought.

The amount of time necessary to make, to repair, to launder and to keep in shape all kinds of clothing and shoes also requires attention.

Perhaps the most important element of fatigue study in the home has to do with habit. For a long time education, and lately industry, has concerned itself with the question of habit. In the old days bad habits were given the most attention, but in these days, it is good habits that are stressed, and their usefulness as a tool for efficiency. The home is the natural and most profitable place for habit formation. The child is in the

home during the years when it is most easy to form habits, and the habit of fatigue elimination, of thinking along the lines of the causes and effects of fatigue should be started at an early age. Fatigue Study is a practical thing. The theory of fatigue and its causes; the science of measuring fatigue;—these are extremely technical and are, as yet, in the laboratory stage. But the practical application of rules for preventing unnecessary fatigue and for providing for overcoming such fatigue as must necessarily result, is simple and easy.

Fatigue study can be followed in any household where there is a willingness to undertake the work, to look the facts in the face. It is not necessary to outline the process here. It is the same as it is in the industries; first, the survey recording the present conditions; second, the careful study of the conditions as they exist and the outline of the changes to be installed; third, the introduction of the new standards; and fourth, the most important, the maintenance of new habits after they have been formed. The greatest success, of course, will result where there is the greatest amount of cooperation among the members of the household.

It need scarcely be said to an audience like this that the presence of an industrial engineer as a member of the household will greatly accelerate progress,—for so much, not only of the theory, but of the practice, of better management that has proved successful in the industries may be transferred to the home. Process charts, progress charts, standardization, incentives, learning to think in elements of motion, the theory of tolerances,—these and almost countless other methods and devices of management, well known in the industries, should become equally well known in the home. Of course, any one, and especially, perhaps, the intelligent home-maker, can study the literature of management and easily transfer from that vocabulary to the home vocabulary. How much easier, however, it is when a member of the household already uses both vocabularies more or less freely, and can not only think the thought thru into the new field, but apply it directly. And with such worthwhile results to the home and to the industry as well! For the home is not only the field from which our industrial workers come but also that to which they go. With the proper habits of fatigue elimination in the home, the worker will go to work better prepared to work and utilize the time of rest and recreation.

One thing more: There is an emotional factor in behavior as affected by fatigue which has as yet received little study, and which is often underestimated or not considered at all. Yet we all know it. It is embodied in a line of Kipling, "To work for a year at a sitting and never be tired at all."

We all know that it is possible to work for a long stretch and become extremely fatigued, yet apparently recover because of some emotional stim-

ulus, like praise or some other reward. We all know that it is possible to be working without fatigue, yet suddenly to experience excessive fatigue under a depressing emotional influence.

The home is the great emotional factor in the majority of lives. It is the finest experiment station in the study of the effect of the emotions upon work and fatigue.

Psychologists, psychiatrists and physicians, who are studying these problems have not as yet formulated a definite working practice for either the industry or the home. But we, at least, know the importance of incentive and motivation, and especially the profitable results of seeing that the reward for success is adequate and prompt.

Where industry is efficient, both reward and punishment are satisfactory, if not always satisfying. The home, however, can not only control its own incentive, but can supplement the plant by seeing that the fatigue eliminating effects of the reward are conserved, and that recovery from the fatigue causing effects of the punishment is assured.

Thus Fatigue Study in the home can not only utilize the experience of industry, but can assist industry to eliminate waste, conserve energy, and add to the efficiency and happiness of the community.

SECOND SESSION

Wednesday Evening, April 27, 1921

Chairman: VIRGIL M. PALMER

Eastman Kodak Company, Rochester, N. Y.

CHAIRMAN: This meeting tonight is to be devoted to what I would call sales methods—the question of selling modern management. Sales managers have found out in the last two years, if they didn't know it before, that there was a vast difference between order-taking and selling. Order-taking involves an apathetic action on the part of the buyer—he wants something and he places an order for it; selling is a direct reaction to the action—and at this time, vigorous action—of the seller, and there is a vast difference.

To get across the message of modern methods, all departments of an organization must be thoroughly sold; all departments must realize their responsibility and all individuals must realize their responsibilities as well as the reward which they expect to get from them; each division must realize its part of the work to the entire work.

We have tonight, as our first speaker, a man who is well qualified to cover this subject from its broad angle—a man who can speak of all departments and their relation to the whole—Mr. Phil A. Grau, who will speak on “Selling the Idea of Modern Management to the Stockholders, Managing Executives, Departmental Managers and the Workers.”

“SELLING THE IDEA OF MODERN MANAGEMENT”

PHIL A. GRAU

Executive Director, Milwaukee Association of Commerce

There is nothing in which the manager of a modern plant is more deeply concerned than the giving and rendering of what is summed up in one word “Service.”

It makes no difference what the nature of a business may be, “Service” is the keystone of the arch upon which rests the success of its commercial career. Finances, of course, are necessary to buy raw material, hire men, transport both raw and finished products, pay for machinery, up-keep, insurance and other items. But they are not matters of consideration in this discourse excepting insofar as they apply directly and indirectly to the management of any concern in its productive capacity. And all of them are dependent for results upon proper management.

Proper management is that which produces the most economical, and, at the same time, the most comprehensive results with the least expenditure of money and mental and physical energy, as well as the use of the smallest quantity of material in making a product efficient. And in proper management there rests primarily the power as well as the responsibility of rendering service to customers and securing service from employees.

Management has been necessary in various enterprises ever since manufacturing, transportation and commerce kicked about in their swaddling clothes. But strange to say, in many industries, it has apparently not kept pace with the progress made in machinery or mere mechanical methods of production.

Millions upon millions of dollars have been spent in industry, not only in the United States, but all over the world, in endeavors to invent better and more economical machinery, in endeavors to make workshops safer and protect the health of workers, but comparatively little effort has been made in the study and handling of the management of men.

It is true that some individual concerns and even some industries have in recent years put in a great deal of time and thought as well as well-directed effort toward this end. But compared with the other endeavors mentioned, the time and money spent in the development of this particular field is, we believe, comparatively small. This means that men have overlooked the study of service both to the buyer and from the men whom they employ in their shops or factories. Yet service is practically the lighthouse by which productive and distributive industry must be guided.

It will avail a manufacturer nothing if he has a wonderful product, but does not know how to sell it, or if he does not treat his customers in such a way that repeat orders come with very little effort because of the satisfaction given by his product. But likewise, it will avail him nothing if he has the finest product in the world, and the best trained and skilled workmen in his line if they will not render to him the service in the production of his goods which is necessary in order that they may be produced fit for the use for which they are intended.

Does not this, therefore, hinge practically upon the management of men in industry, whether they be customers or whether they be producers? It certainly does.

Let us consider for a moment, the old-time merchant who is willing to sell what he can without much effort and who is not interested at all, or at least to any great extent, whether a customer is satisfied with what was sold him after he once has his check or cash in payment for it. He is nothing more or less than an automaton. If his business does grow, it is because the city is growing, or because the name of his concern was inherited from

his father or grandfather and much of the impetus the old man gave it carries it along, or because he has sold some article that nobody else can make and which everybody needs. He deserves no credit for his success. With little, or no good will in most instances to fall back on so far as his trade is concerned, he contributes nothing to the commercial world that is constructive and, in general, is anything but an asset in the field of industry and commerce.

But, let us put side by side with him a modern merchant or manufacturer, be he large or small. He is always alert for new sales and new customers, but he is not satisfied with merely getting his check or cash in payment of what he sells them. He follows them up and ascertains whether they have any complaint to make, whether the product he has sold them is giving satisfaction, what its weak points are, if any, and how he can correct them. The result is that people are not only satisfied with what he sells them but they will give what in the parlance of the street or phraseology of commerce may be called an "even break" or more than an even break, when they need goods in his line. Why? Because they have received service not only in the article they purchased but from him from whom they bought it.

Let us take this thought now into the factory. It is just as important that the men who help to make the finished product out of the raw material which the manufacturer takes into a plant to work upon, render service to him, as it is that he should render it to his customers.

But there is this difference. He recognizes and feels that responsibility toward his customers. But his men do not always recognize and feel that responsibility which they owe to him. It may be asked, Why? The answer lies in the fact that he himself has not sold himself or his foremen to the men who are working in his plant because there is ever present in their minds the thought that they are working for him, instead of the inspiration that they are working with him.

In April, 1919, Arthur Frederick Sheldon in an address before the Civic Industrial Division of the Chicago Association of Commerce, said that "a man in the mass glories in **leadership**, but that he doesn't want **drivership**." And he followed it a little later in his address with the further sentence "The man who says 'I am going to run my business' is different from the man who says 'I am going to lead my business'".

Let us at the outset understand one another on this point. Ability in brains as well as in brawn, if applied with untiring energy, is bound to be successful. That is why men who have started in at the loom or even in the ditch have risen to leadership in their various lines of work. We cannot all expect that we will all secure a share of wealth equal to that of our

neighbor. Some of us will always have more than others. While it is true that all men are created free and equal in the sight of the Almighty, it is nevertheless also true that men are not equal and never have been in their ability to succeed in various walks of life and professions, even if they may be sincere as sincerity itself and work as hard as they are able to.

If all the wealth in the world were piled up in Juneau Park in Milwaukee tomorrow morning and at ten o'clock it were to be divided equally among the men in this room—all of whom are of exceptional intelligence and ability—some would have more than others before thirty days went by. If you divided it among all the people in Milwaukee some would be bankrupt before evening. Just as there are strong men and weak men, morally as well as physically, so there are strong men and weak men in the world of industry and commerce.

We might also cite, by way of example, that some men become Admirals in the Navy and Generals in the Army, while others remain in the firing line.

But that does not absolve those who are in the ranks of leadership from the responsibility which attaches to them through their duty to the men in rank and file beside them and in their community.

If you want men to produce, if you want them to build, if you want them to render service unstintingly, there must first be created in their minds and hearts the desire, the feeling, of interest in their work, and the desire to constantly do better in it. This means a well-fed body, a comfortably clothed body, a comfortable home, the ability to give the reasonable comforts of life, depending upon the surrounding circumstances and conditions, to their families, as well as reasonable recreation. It means not merely a living wage. It means a thrift wage. It means paying men not merely the amount of wages at which they are willing to work in order to keep themselves and their families from starving, but it means a wage that will give them and enable them to keep their families in comfort with some recreational facilities added.

Let us not misunderstand this. It does not mean that we should all get enough, whether we work in the office or in the factory, to ride around in high priced motor cars, enjoy box seats at the opera, or keep private yachts. But it does mean that there should be enough income in the working man's family over his wages to enable him to keep body and soul together, educate his children, at least through graded school if not, in many instances, also high school, have a comfortable little home, go to the movies and the theatre occasionally, and partake of other innocent healthy forms of amusement.

Picture men working under wages such as are needed for these things.

and you will undoubtedly have before you not only a lot of contented workmen, but a lot of men who will throw their heart and soul into their work, not looking at the clock every half hour to see whether it is time to quit, but constantly interested and bent upon greater production and efficiency.

This is what is desired and what is inevitably the result of modern management. But how shall we sell it to those who, after all, must be sold upon it before it can be put into effect? For no matter how good your production manager may be, no matter how well versed in his business or how well liked by his men, if the principle of making men work **with** you instead of for you is not sold first to the man or men on top, it can never be carried out in practice by those who represent them as the heads of departments, as foremen, and as workmen in their establishments.

How can you get service from your men?

Some time ago it was my privilege to discuss this question along similar lines. I believe there are few, if any, of you who heard or read that discussion, and therefore I am going to take the liberty of repeating to you part of what I wrote and said then in answer to the questions "How can you secure this much-desired result and condition? How can you sell it to the man on top? How can you put it across?"

If it should be my privilege at this moment to talk to the men on the bridge of the ship of industry while it is tossing about on a commercial sea that is disturbed by winds of discord and waves of trouble and suspicion which threaten to impede its progress and, in some instances, to cast it upon the reefs, I would say to them in all sincerity, "The men whom you employ may not have had the advantage or opportunity in education or business which you have had, but they are as human as you or anyone else." To them could be applied that same masterful comparison of Shylock when, in Shakespeare's memorable words, he said, "Hath not a Jew eyes? Hath not a Jew hands, organs, dimensions, senses, affections, passions? Fed with the same food, hurt with the same weapons, subject to the same diseases, heal'd by the same means, warm'd and cool'd by the same winter and summer, as a Christian is?"

Employes of the past and some of the present might well many times have paraphrased these words in comparing themselves with some unscrupulous employers. The man who toils with his hands is as much a man as he who works with his brains. But, unfortunately in the high speed of development of industry in the past, many have been so busy checking up bank balances and profits and so little bothered with the necessity of conservation in human labor because of the tremendous supply formerly at hand, that they have overlooked the basic principle of the relationship of the man who hires and the man who is hired.

This is no time to moralize, but we must always remember that we are only stewards of our possessions. The right of private ownership is a recognized one. We may have and hold anything and everything that we can legitimately secure from a moral standpoint **provided, of course, in our enjoyment of it we do not jeopardize the rights of others.**

We have the right to engage men and women to work for us in the various lines of employment. We have the further right to bargain with them as to the compensation they should be given therefor. But there is no justification morally for hiring anybody for the performance of any work at a price as low as he is willing to work, if that price is such that it does not give him a decent, respectable living, taking into consideration all surrounding circumstances.

It would be absurd to contend that the president of a bank with millions of deposits, upon whose judgment and management depends the safeguarding of hundreds and thousands of dollars of both rich and poor depositors, should be entitled to no more than the man who tamps the roadbed or who drives a garbage wagon. But the roadbed tamper and the garbage wagon driver are also engaged in honest labor. Somebody must do that work, and the men who do it are entitled to enough to keep body and soul together in comfortable circumstances, rather than in squalor, and, as said before, plus sufficient to enjoy some of the less expensive pleasures of life as well as the cost of raising and educating their children.

Unfortunately, this has seldom been seriously considered in the past. Thousands of men have hired others for what wages they could, irrespective of what they deserved. Their attitude was "To hell with the working man! We can get more workmen than we need anyhow."

It is not odd, therefore, that the under-dog began to feel resentful. Alone, he was helpless. Lacking education, he knew not what to do for himself. He groped ignorantly in the dark, worked like a slave, and took what he could get, hoping and praying for better times.

Gradually there came the knowledge that by getting together with his fellow laborer he could better his condition. Unions were formed. Collective bargaining on their part arose. They were not very strong at first, but they have grown in numbers and effectiveness until within the last decade they have become a tremendous power, sometimes for good, and, be it regretfully added, frequently for evil.

But they were only the outcome of the shortsightedness of some employers themselves who forgot their duty to their employes. During the war and for some time after it, the tables were turned. The employee was no longer on the market in such abundance that he could be picked off the corner like the proverbial peanut from the stand by a passing policeman.

Conditions were completely reversed. Employees were scarce and found themselves for the first time in generations in a position to dictate rather than be dictated to. Most of them became as arrogant as some employers in the days gone by.

If that had been all, the situation might not have grown serious, for there are always sane heads on both sides of mooted questions whose judgment eventually rules. But there was injected into the situation at that time, an element of brainless, irresponsible agitators whom respectable leaders of labor unions never like to have anything to do with and whom other men of brains, if not necessarily of wealth, cannot do other than despise. They secretly endeavored not only to work havoc among themselves by trying to convert the laboring man into the spirit of mob rule, but they even attempted to undermine the principles of our government itself. And, sad as it may seem, it is nevertheless true that today, when the pendulum has again swung back and there are more employees than employers can possibly make use of, we still have with us and in greater numbers, men who would mislead the employee by a vocabulary in which law and order are conspicuous by their absence. Murder, arson, pillage, plunder, and loot are foundations of their catechism.

Many of the toilers who have not had the chance of an education and whose minds have not been trained to look for flaws in sugar-coated arguments have fallen, and are still falling, an easy prey to these unscrupulous wreckers of society with the result that the situation which industry faces at this moment is far from desirable, and the difficulties in our industrial relations unsolved. As in the days gone by, workers can strike. They can soldier on the job. They can boycott. They can ignore their contracts with their employers. Employers can close their plants, resort to lock-outs, discharge some or all of their men at will, and battle to a finish.

But the slightest study of this problem from an unprejudiced standpoint inevitably brings the conclusion that neither employer nor employee ever benefits in the end by such procedure.

The reasonable solution of the great question, it would seem, ought to be found in a broader and more tolerant spirit of co-operation between employer and employee. There are many obstacles to be overcome before this can be accomplished to the degree desired. Many employers are still hot headed and hard hearted, and employees in great numbers are itching to get even and gloating over their opportunity to do so.

Education of the ignorant employer as well as the ignorant worker alone will solve the problem. But that education can only come through the sowing of the seed of understanding by cooperative endeavor. The present temper of the employee will not cause him to make the first move

in that direction. If the employer will but take the first step and if he will enlighten the employee in order that the latter may understand what is today a fact that hundreds upon thousands of employers have the interest of their employes at heart, he will bring back the confidence that existed years ago between the boss and his men, and they will be more readily led to believe in the man in whose plant they are working than in the agitators who endeavor to lead them to destruction like the Pied Piper did the rodents of Hamelin.

The employer's opportunity lies before him. He may take it or leave it. But the world has learned a wonderful lesson in cooperation through the great war. The spirit of selfishness will undoubtedly endeavor to master humanity as it has done in the past. But in the main, mankind is getting better, morally speaking, every day. Even the pessimists only spur it on to the accomplishment of nobler and higher aims.

Are we going to lose the fruits of the tremendous struggle we went through only a few years ago, or are we going to show we are big enough and broad enough to throw petty jealousies into the discard and build our industrial structure upon that basic principle of manhood: "Do unto others as you would have others do unto you!"

The employer against the employee will mean nothing but a world of constant industrial strife.

The employer and the employee will bring us peace, happiness, contentment and achievement, morally and economically.

Pay your employes one hundred cents for a full dollar's worth of production, but see that you get it. Tell them that if they give it you will pay it. Get your men to work with you and not for you.

Take your foremen aside and point out to them that they are the point of contact between you and the men. Tell them not only of the policies of your concern but give them the reasons for them. Don't pass over them lightly by saying "The front office thinks so and so—", or "The business manager is of such and such an opinion—". That means nothing to them in passing. Show them you have confidence in them by giving them some facts and figures. Sit down for a few minutes and go over things with them in more or less detail. Make them feel that they too, are a part of the concern, and that it can only carry out the underlying principles on which it is doing business both with its customers and with the men in the plant, if the foremen cooperate one hundred percent with the management.

Tell them they are a part and parcel of that management so far as results are concerned. Just as the customer in a department store gets his impression of the management from the clerk who waits on him, so the man who works in a factory gets an idea of his employer through the point of

contact, namely, the foreman. The foreman is the clutch between the engine and driving shaft in every establishment. If that clutch functions, you get the maximum amount of possible power that can be delivered to the wheels. If it slips you are losing efficiency. If it doesn't engage, your machinery will stand still.

The foreman is the man you can reason with. He has worked his way up to a position of responsibility, or he would not be a foreman. Set him right and he will set your men right. But if he is not right himself, your point of contact lacks a great deal.

Rev. William T. Dorward, author of that inspiring work, "The Master Key", uses a very apt illustration with reference to the foreman when he likens him to the sergeant and his men in the army.

He says that just as the sergeant has control over his company, and just as his men can rise upon the recommendation which he gives them upon their record in service, so the men in the plants may go up in rank from privates to commanding officers.

And he adds that some rise, and rise to positions of prominence, while others never rise at all.

It is true that in many industries various schemes of industrial democracy, workmen's councils, and establishments of a similar character have been tried with varying degrees of success. However, it must not be expected that industrial democracies, workmen's councils, shop forums, and similar institutions can be bought over a counter like suits of clothes. Even if the best cooperative plan between the management and the men were offered to every manufacturer in the country at this moment, stamped with the seal of approval of the greatest economists and labor leaders in the world, it would still require not only re-moulding to fit the individual plants, but it would take a great deal of intensive cultivation on the part of the men themselves, as well as the management, before they could see its desirability and before they would be mentally ready to give it a trial.

These things are somewhat revolutionary in character. They are sanely revolutionary, it is true. But just as man had to be won over to electric light, the telephone, automobiles, cooking with gas, and the aeroplane, so new institutions in business must be sold to both the employer and employee by education and by the establishment of good will in their favor before they can become successful.

No plan in industry, be it one of production, advertising, or salesmanship, can succeed unless the men responsible for putting it into action are themselves sold upon it before it becomes a part of their individual business institutions. This means that the ground must be prepared for the seed that is to be planted. In fact, it may mean in a good many instances, that

that seed must be crossed experimentally with other seeds of similar nature. It may mean hot-house experimentation, if that simile may be used. It means that only when employers and workers understand the What and the Why of such an arrangement can any successful installation be attempted.

Let us not confound this sort of operating plans with welfare work. That is something of an entirely different nature. When it is properly conducted the men like it. But if it is not properly handled, they look upon it with suspicion. In fact, in many cases, they regard it as a sop tossed to them in the nature of a charity and they resent it. But when it is sincerely conducted, with actual benefits in mind and body, it stimulates cooperative activity on the part of the workers.

But it will be well to remember in the last analysis the best welfare work and the greatest stimulant to interest in a man's job is what he gets in his pay envelope on Saturday night. There is no employer who is not willing to pay a man everything that he is worth if that man will give that everything to him in return. But it is necessary to get his mind and heart, it is necessary to get his confidence and interest. It is necessary to get his cooperation to produce that feeling on his part.

Get acquainted with your men. Show them you are as human as they are. Go out through the shop occasionally and call some of them by their first names. Sit on the sidelines of a few of their ball games, and yell occasionally, even it jars your dignity, presuming that it can be jarred.

Hand them a cigar occasionally if you meet them. Ask them how the baby is and how the family is getting along. Take an interest in their health and happiness. Let them learn you are interested in them as human beings and not as cogs in a wheel of your machine. Get across to them the idea, by personal contact, that you are always willing to hear their individual grievances, if they have any, but that you do not propose to let any man or set of men presume to represent the entire shop, when he or they do not, in reality, represent more than a small fraction of its workers.

Let them know that you, too, are working and worrying as well as they, in order that their pay envelopes may not be empty Saturday nights and in order that you may increase their wages, if it is possible to do so, from a business standpoint. Most of the men today, particularly in big establishments, do not know their employer from a last year's bird nest. Their impressions are all wrong because of the aloofness with which he surrounds himself. Such employers forget that the friendly look in the eye, the smile that passes between man and man, has a far greater power than all the gold the world can dig out of the earth and harness through machinery. The average man doesn't expect more than a square deal. But he does expect that. And he is going to get it. Morally he is entitled

to it. But over and above and beyond the moral issue, business statesmanship must dictate to every business man of common sense that from the standpoint of practical results, his men must be handled like human beings, must be given proper consideration due them, must be well paid, justly paid, honestly paid, not over-paid nor under-paid, must be given conditions to work in that are healthy and happy and must be made to feel that they are working side by side with the man on top instead of for and under him.

Modern management of men realizes that only this sort of treatment will result in service and service results in benefits morally and financially.

Presuming that we have been able to secure an attentive hearing this far, let me suggest that I would conclude my arguments by saying to these same captains of industrial ships, "Why not call in an industrial engineer?" When I use that term, I do not mean the so-called industrial engineer, but the real, thorough, studious, well balanced, efficient analyst and constructor who knows his business and can build with lasting and effective results. There are too many men calling themselves industrial engineers who would lead us to believe that a mere cursory examination of conditions in a plant enables them to prescribe a curative by a mere stroke of the pen. Your profession, gentlemen, suffers from that kind of men because those in industry who have been misled by them are likely to be prejudiced for a long time, if not forever, against your profession, just as a man who, in the parlance of the street, has been "stung" by a "shyster" is permanently convinced that all lawyers are crooked.

Unless men who have had such an experience with so-called industrial engineers meet men who are really worthy of the name they can never be expected to avail themselves of the efficient service your profession offers. I would say, therefore, to those gentlemen who are looking for assistance in steering a straight course for the harbor of justly earned dividends, "Get an industrial engineer who will tell you at the outset that he not only must make a careful survey of your plant before he can suggest what you should do in it, but who will also tell you that after he begins to do it, it will take months, if not a year, before the effect of his labors in your behalf and his work with you will really be evident."

A knowledge of theory without practical application has ruined many a future. But the combination of theoretical knowledge with ability to apply it in a practical manner inevitably brings results which, in many instances, can be charted even like the mariner does his course from one port to another.

Therefore, the industrial engineer worthy of the name, can and must bring home to both management and men, the necessity of constructive co-operation which will beget the greatest essential of all in industry and commerce, namely "SERVICE." Modern management will assure it.

CHAIRMAN: From your close attention, I know that you followed Mr. Grau very closely and I know you agree with me that he went straight to the point.

If we should analyze the characteristics of big men who have accomplished great things, we would find that among the different elements which they possess is one which is strikingly in common. The limits of time and capacity are about the same in all men—all are limited to twenty-four hours in a day. To accomplish a lot of work we must delegate work to our subordinates. This characteristic, this ability of selecting subordinates and training them and developing them, is what has made big men.

If in an organization word goes around that all positions that are worth while are filled by men outside of that organization, it kills the morale. The bulk of positions must be filled by men taken from the ranks—it must be an upgrading of men. But if an organization takes from its ranks men who are not competent, who are unprogressive and not aggressive and not broad and capable, sooner or later that organization will die and go on the rocks. It is for this reason that this question of the development of leaders is of such great importance.

For our next speaker we have a man who is exceptionally competent to talk to us on this problem. Mr. Montague Ferry, of the Armstrong Bureau of Related Industries, will talk to us on "How to Develop Leaders from Among the Working Force."

MR. MONTAGUE FERRY: In some years of industrial relations work, personnel work—whatever you wish to call it, it has always been my contention that the hardest thing a man had to do who believed in the more scientific attack upon the problem of human relations, was to sell the "big chief" as I choose to call him.

Mr. Grau's talk, of course, precedes very logically the question that I am to discuss, and in looking over the program of this convention I was impressed with the fact that somebody was a good arranger. I don't want to appear to crawl in and share his glory, but at the same time I do want to apologize, in a measure, for the fact that in the very nature of the case the last part of his talk and the first part of my talk will, without question, have their points of similarity

"HOW TO DEVELOP LEADERS FROM AMONG THE WORKING FORCE"

MONTAGUE FERRY

Armstrong Bureau of Related Industries, Chicago

In looking over the program of this Convention with particular reference to the part this paper was to take in the proceedings, I felt impelled to compliment the program committee because of the order assigned to the subjects. Mr. Grau's talk on selling the idea of modern management to the executives, owners and directors of the business so logically precedes any discussion of developing leaders from among the workers that it is an extremely happy circumstance that I follow him.

The most enthusiastic student, or practitioner in industrial relations and management must in all honesty admit that one of the first and greatest obstacles is likely to be an antagonistic attitude of mind on the part of those whose approval must be gained before progress can be made. This in spite of the fact that only recently the great cry of industry was "production," and the big obstacle to production was lack of men and a resulting independent attitude on the part of men or workers who could be obtained.

In those days not far past men who knew, or claimed to know, how to get industrial peace, to prevent strikes, to bring about greater individual effort, were in demand and their services were considered cheap at any price. That condition has changed. This point may not be argued by those present, but as proof of the statement it seems entirely proper to say that during the latter half of 1919 and the first half of 1920 one found himself receiving numerous requests for the names of men qualified to serve as employment managers, personnel managers, or directors of industrial relations, while during the latter half of 1920 and so much of 1921 as has elapsed, there have been a considerable number of applications for positions of the same character from thoroughly qualified men. The pendulum or the balance of power started swinging toward the workers' side of the age-old controversy shortly after the late war began, and helped along by the tremendous need for men, reached a point where many people felt that labor was going to take over the control of industry and that the employer would be forced to accept the dictation of those he employed.

Almost over night the situation was changed, the employer is again able to get all the help he wants, and thereby resumes his position of vantage. It is the most natural thing in the world that the employer of a certain type should want to feel that power and enjoy the sensation for a time before he gets down to a scientific study of the problem of industrial rela-

tions with a view to putting those relations on a basis which will not be entirely upset by future wars or other phenomena. I do not defend this state of mind on the part of any employer, but I do say that it is entirely natural because in many cases the representatives of labor were arrogant to a degree that left a deep scar on the minds of the employers with whom they dealt.

In any plant which the personnel manager or industrial engineer approaches, there is a question that in one form or another should be asked, and the controlling factor in that plant is the only one whose answer will be worth anything. The question should read something like this:

“Do you sincerely want to develop real leaders from your working force who will be in a large degree sympathetic with that force, or do you prefer to pick men arbitrarily whose minds will go willingly with your mind and who will disregard the hopes and aspirations of the workers?”

Or, phrasing it a bit differently:

“Do you want puppets who will jump when you pull the strings, or do you want leaders who understand and appreciate the workers’ viewpoint and will help you to a like understanding?”

Perhaps these questions may seem not only direct but a bit radical to some of us who after all to a certain degree are dependent upon the general managers or owners of our business for our living. Perhaps there are other ways—more tactful ways—by which the answer to this question may be obtained, but certain it is that in one way or another we must get that answer before we start actual operations, because without the proper attitude and support from the powers that be, the task of developing constructive leaders from the ranks is well nigh impossible.

Let us assume, then, that the “big chief,” whatever his title, has become properly convinced of the value of leaders developed from the working force. In order to keep from wandering afield and attempting to cover too much territory, I am going to ask you to consider that I am speaking of a plant of one thousand workers, divided into ten departments with four departments operated by women and six departments operated by men. Three of the ten departments are thoroughly unionized, while seven are open shop. I think a moment’s analysis of this imaginary plant will convince you that I am sincerely trying to meet all the difficulties that might arise in an average factory and that we would have a hard time choosing a set of specifications which would give rise to more problems than this one.

The first principle which seems deserving of thought in beginning our

search for leaders is that each one of the thousand workers is a possibility until careful analysis of his qualifications proves otherwise. In that statement I would include the foremen, because while the foremen may not in many cases class as workers, they are certainly material for development to fill higher positions and they will logically be succeeded by those leaders we develop from the ranks.

Mr. Whiting Williams in stating his conclusions as to the temper of the worker makes it very clear that a principal cause of unrest is uncertainty, and suggests as a remedy some means whereby each worker may feel certain of continuous work and continuing pay.

That mentor of our profession who said so many things which caused a tempest in his day, but which we are coming to consider as good doctrine after all (I refer to an old-timer by the name of Ruskin) made the certainty of employment and progress one of the chief points in his description of a satisfied, and hence productive, group of workers.

Mr. R. B. Wolfe, whom all of you know as the father of that plan which increases production by putting before the worker a means of visualizing his progress, has also touched upon the thing that keeps the worker happy and of course all of us realize that a happy worker is almost invariably a productive worker.

Now with these three authorities arriving at much the same conclusion by different routes, it is only a step further to conclude that unless we sincerely consider every one of our thousand workers and the foremen as prospects for leadership, we are not only going to overlook some fine material but we are going to remove from this body of workers much of the incentive to development into leaders. It is quite logical, of course, that from our thousand workers many will be eliminated as possible leaders by qualities or lack of qualities over which we have no control, no matter how helpful we should like to be, and yet I would like to illustrate at this point the danger of taking too much for granted by telling of an instance which actually took place in a factory with which I am well acquainted and which measures up reasonably well to the specifications that have just been set forth.

An executive of that plant came into contact with a young girl, one of a large family, who had been born with an impediment in her speech and other somewhat important handicaps. He became interested in the case and through oral training and instruction in elocution was enabled to correct the impediment in the girl's speech, and to overcome in a measure the other characteristics which had been obstacles to her development. With these handicaps removed she developed an ambition to become a leader and expressed her willingness to do any kind of work available to get the necessary funds.

The natural result was that the executive should find her a place in his factory. It might be added that he had serious misgivings in doing so. During the first few days of her factory work the other workers found her flighty and many of them thought she was not "all there," as the saying goes. After a comparatively short time she had become a leader among the female employees in the plant with which she came in contact and she was the most constructive unofficial leader that could be found. Unfortunately enthusiasm and sincere desire to give the plant the best she had could not overcome some other handicaps so she was not qualified to become a forewoman or to head a department. I can honestly say that it would be difficult to imagine a less likely candidate for leadership than this particular girl, and yet her leadership has been thoroughly constructive and has been a decided asset to the plant.

This incident, told primarily to illustrate the fact that almost any employee may have capabilities for leadership that only need development to make them a positive asset, brings out another point that seems important; there are only a certain number of positions in any plant which supply the opportunity for official leadership, but there are many workers in the ranks who, if given half a chance, will become unofficial leaders of high potential. Any group of people meeting together day by day and having a certain community of interest will develop their own leaders, and it is largely within the power of the executives of a plant to say whether these unofficial leaders will be constructive or otherwise.

In determining what qualities go to make up leadership it is a temptation to set down or manufacture a chart along scientific lines. I am going to refrain from this exercise for two reasons: the first and probably the best reason is that most of you folks are more scientific than I ever will be, and don't need amateur suggestions. The second is that the minute a set chart of this kind is made, we are quite likely to overlook qualities that are valuable but which could hardly be set down in a chart.

It seems to me that when most people think of leadership they subconsciously visualize a strong-minded, forceful character and in some cases even go so far as to put a gun, a club, a sword or some other means of physical demonstration in that character's hands. Perhaps I err on the human side, but I believe that the possession of the will to command is more often than not a liability rather than an asset in industrial leadership.

Without any attempt to be scientific for the two reasons set forth above, it would seem that the first qualifications of a prospective leader to be drawn from the ranks and developed or to be developed first and then drawn from the ranks, would be that of the standing of the individual with his fellow workers—not only his job in general, but the respect in which they hold him, their reaction to his influence, and their belief in his honesty.

Next in importance I would place the quality of ambition, because without a definite ambition to progress he is not going to take advantage of the efforts to develop him.

His intelligence and ability to learn might be placed next because there is much that he will have to grasp almost intuitively and much more that he will have to learn by earnest effort. His knowledge of the work would come next because if he were a skilled artisan it would give him certain definite advantages.

There is reason to believe that some of you wonder why I have not put our prospective leader's attitude toward the management up with the other important qualifications. I believe it is in truth the least important of his qualifications because if we are sincere in our effort to make a real leader of him, and if we are sincere in our desire to treat our people fairly, justly and in such a manner as to inspire their confidence, we will have no difficulty whatsoever in bringing this man into the proper frame of mind toward the management.

You remember that in stating the specifications for the plant on which this discussion is based, there were three departments which were thoroughly unionized; generally speaking one expects the union man to have all the doubts and all the unhealthy attitude of mind toward his chief that any employee could have. You will recall quite clearly that union men have ever contended that labor was not a commodity. The following incident is certainly illuminating as to the possibility of bringing a man's attitude toward the management to a constructive point.

In our representative plant there is a form of government based on employee representation which has been very successful for approximately three years. About a year after the plan was started, one of the employees brought to this Board of Appeals a request for higher wages. The management explained that competitive conditions and the practice in other plants made it impossible to meet this individual's demands. He thereupon insisted that it was his right to see the books of the company that he might check the statements made by the management.

It was the representative of one of the unionized departments, and himself a union man, who promptly got up on his feet and stated that no employee had any right to make such a request, that the management had every right to buy the services of its employees at market rates and to sell the products of their labors at such profit as could be obtained. Perhaps in passing it might be said that this particular company has had some trouble with the unions at times, but never of a serious nature nor of a sort that was not readily cleared up, though it ranks as open shop.

It goes without saying that some form of government in which the em-

ployees are honestly represented clearly simplifies our task of determining which workers are material for leaders and in choosing and developing those individuals. One point in this particular case, however, seems to require enlarging: we have noticed that a union man has apparently forsaken a definite union principle and has defended the right of the employer to keep his business secrets to himself. Every plant has certain individuals who lean heavily toward the idea that the owner is getting rich and that the worker is not getting a fair share of the returns from that business. The leaders that we are to find and develop in our plant must necessarily meet this sort of argument from these doubters and in order to meet it successfully they must have definite, conclusive material with which to work. I realize fully that there are few manufacturers who have reached the point where they are willing to discuss such intimate records even with those in whom they have the greatest confidence and much less with those who are being developed and who have not arrived. Yet it can be readily seen that a measure of such information is absolutely necessary if ours are to be real leaders.

If for one reason or another it is impossible or undesirable to have a plan of plant government based on employee representation, the next best means of choice and development of leaders is the "open door policy." It is well for us to be sure that we have this "open door" phrase clearly defined. Captains of industry, after they have arrived at the point of success, quite frequently cite the "open door policy" as one of the rungs in the ladder by which they climbed. In other words, they are prone to say that all through their industrial career they have been accessible to their employees and that they have always maintained the open door. In the earlier days this was possibly literally true and sentimentalists still dwell heavily on the necessity of the "open door" as method of improving industrial relations. However, it is a very difficult matter to accomplish in practice, not alone because of the heavy demands on the time of the chief, but also because of the size of the working force. More important yet, it would be either an extremely forward or an extremely militant employee in our plant of a thousand workers who would run the gauntlet of desks and people through which he must pass in order to reach the big chief.

The real practical modern substitute for the true "open door" is an individual who has the full confidence and support of the head of the business, who has his small and unpretentious office where the workers can reach him without washing up or changing their working clothes, and who has the time and ability to listen, analyze and capitalize constructively the grist that comes to him. Of course I am describing that important factor in industrial affairs variously known as the personnel manager, the superin-

tendent of welfare, or the director of industrial relations. Such a man will soon learn to separate the chronic kicker from the man with the real complaint or a worth while suggestion, and he will gradually pick out certain individuals who seem to have the qualifications for leadership and as time goes on will find means of developing these possibilities.

The term "gradually" is used advisedly; occasionally a snap choice of an embryonic leader is successful, but selection of material for development should be based on continuous observation rather than upon a ten minute hunch.

This brings us to a point which may be a bit off the subject, but still related. All of us at times have to choose between making promises that are too big for us to fulfill in the time specified, or losing the contract or position simply because we would not make such promises. One of the best plant industrial relations directors I know (and all of you know him also) prefaced the acceptance of his present position in a most admirable way. The man who had sent for him asked how long it would take to build up proper relations between management and workers. With his heart more or less in the neighborhood of his tongue he replied "five years if we are lucky, and possibly ten; two years may bring us some degree of encouragement, but that's about all." That statement took nerve because he wanted the job, and he knew that his prospective employer, having acquired the germ, wanted results immediately. He got the position and has not only made good, but helped the cause of better industrial relations immensely by his willingness to give others the benefit of his experience and by his total unwillingness to surround his profession with frills and furbelows which an ordinary human being cannot understand. Most of us like to call him "Bill" Grievess, though I believe he was christened William, and in case there are one or two in this audience who need further identification, I will say he has been largely responsible for the splendid results obtained by the Jeffrey Company at Columbus, Ohio.

Getting back again to the peculiar circumstances which surround choosing and development of leaders, and the peculiar positions in which we often find constructive leaders, I am reminded of the case of Jim Smith. Jim was an insignificant looking jack-of-all trades, who seemed to be able to do anything with his hands and who, as a result, was given a little corner by himself where he tinkered with everything from a refractory piece of merchandise to a machine tool.

Aside from this mechanical versatility, his principal qualification seemed to be the ability to do a rather satisfactory amount of work and still carry on conversations with those who from time to time visited his bench.

The personnel manager in the plant being on the lookout for potential

leaders was much interested to hear Jim quoted frequently by various workers with whom he talked. He had considered Jim as a sort of necessary adjunct to the plant, but never dreamed of his having any of those qualifications of leadership for which he was looking. Spurred on by the number of times he had heard Jim quoted, he strolled over to Jim's bench one day and drew him out on many points regarding the work in the various departments, theories of management and industrial relations. He followed this by further investigations as to Jim's standing with the other employees, with the result that it was only a short time before Jim was given an opportunity to prove his peculiar abilities as foreman not of one but of two departments.

I had the opportunity to observe some of the result, and it is interesting to note that Jim as a foreman was just as peculiar in his methods as Jim the jack-of-all trades. There wasn't a soul in the two departments under his supervision who ever had the slightest hesitation in taking his petty quarrels, complaints and grievances to Jim. They would go to him and borrow money, they would ask for advice as to family affairs, although Jim was notoriously an old bachelor, and occasionally he was known to express his views on religion in a way that could give no offense, but which left the impression that he had rather well considered convictions.

In other words, Jim became, and probably is today, that rare sort of foreman who rules absolutely by the affection his subordinates have for him rather than by any spectacular qualities of leadership. One of these two departments over which Jim holds sway was thoroughly unionized, while the other was of the open shop variety—a tribute to his adaptability.

Another type of leader, of the unofficial kind again, is a highly skilled worker in a craft which is absolutely unionized. He is today about sixty-five years of age, walks with a decided stoop and looks out at the world through a pair of glasses so thick that they almost amount to a deformity. Old man Evans has never cared to be a foreman and has often expressed the thought that he would rather be making his weekly bit on piece work without the worries of leadership than to get the extra amount that might go with being an official leader. He endorses shop discipline to the highest degree, never openly disagrees with his foreman, but has been known to make occasional quiet suggestions to that dignitary which have been extremely useful. His ability to lead men has not only been a tremendous asset to the shop in which he works, but his fame, traveling abroad, finally put him into the position of union steward for the district and later brought him the presidency of the national union, which he now holds.

There is a case of a man who did not want to lead, felt he could not lead if he wanted to, and yet who has been of tremendous importance to at

least two generations of skilled craftsmen, who has been an invaluable asset to the plant in which he works, and who is now guiding a successful union along constructive lines, keeping the radicals out of power and in his mild but effective way fighting the radical element in other unions with which he comes in contact.

There are, of course, several generally recognized methods of bringing out and developing leaders from among the workers, and the athletic and social activities which have come to be so much a part of the workers' life in most modern manufacturing plants are often of tremendous assistance to the personnel manager who is searching for material. I know of one young woman who got her chance as a plant executive because of the ability she showed in promoting and managing a picnic to which two thousand people were transported and at which the same number were entertained and fed. Up to the time of that exploit she had been as colorless as any member of a community could be. The picnic not only attracted the attention of the management to her, but also put her in a most enviable position with her fellow workers.

Another case is that of the quiet and inoffensive young fellow, a skilled workman, one who seemed rather to avoid contact with his fellows and might have worked in the plant for several years without his qualities of leadership being recognized had it not been for the fact that he was extremely fond of baseball. The plant organized a team this man made his bid for the catcher's position, proved his superiority, and after the first two or three games was elected captain. The superintendent of the factory had hardly known that the man was in existence up to that time, but being an ardent baseball fan was attracted to some of the qualities exhibited on the ball field, which he admitted he would never have seen anywhere else. The catcher became a foreman and there is little question that the prestige he gained on the ball field among his fellow workers has had much to do with enabling the superintendent to develop his abilities as a leader in the shop.

In looking for leaders it is not always desirable to stick to the production side of the plant. I distinctly recall the case of a girl who started as a clerk or checker in the cost department, and who, overhearing the wail of the production superintendent that he never could get his two hundred odd girls to really work, promptly made some suggestions that seemed to him not only sound, but very promising. Today that girl is supervisor of some two hundred female employees, and the superintendent of production is not doing any wailing about the way the department is run.

On the other hand, I know of a case where a stolid and apparently unintelligent Dutchman came into a factory as a common laborer. For a time he was more or less the butt of all the jokes that could be imagined,

and then the superintendent suddenly discovered that he was possessed of that rare faculty, a nose for facts and figures along with a mania for economy and conservation of waste that amounted almost to a religion. Given a chance to develop these qualifications, it took him approximately twelve months to get out of the factory and into the cost accounting department with the very strong probability that he is going to become one of the most valuable executives that plant has.

Throughout the foregoing rather loose combination of personal opinion and experience, the question of developing the foreman and of keeping him happy has been but lightly touched upon. The reason is that he is important enough to be given individual treatment. None of you need feel that I am going into a long dissertation on the importance of foremen. Much has been said and written along this line in the past few years, and I think that every bit of information and viewpoint we can get on the subject is thoroughly worth while. Certainly in developing leaders from the working force, the foreman has tremendous power for good or evil; working at close range with all the employees in his department he can, if taken into the confidence of the personnel manager, help pick out promising material and be of great help in developing it. It is also obvious that he can block all our efforts without actually revealing what is going on. He must be sold the big idea now so generally accepted among executives—that he is not a successful leader until he is doing his bit in developing other leaders, and that by this development work he will profit both directly and indirectly. If we can get this idea across, he will be a bigger, broader leader himself and a more sympathetic one, without in any way lessening his loyalty to the management; he will come to pay more attention to the human qualities of those he directs. As he begins to look at his subordinates from the human side, he also naturally falls into the habit of considering them as his proteges, some more promising than others, but all of them in his estimation susceptible to education and development. It does not take much imagination to visualize the result of such an attitude on his part on those who work for him. They see his interest in them as individuals, they see this or that fellow worker progress because of the afore-mentioned interest and educational effort, they completely lose the idea that he is a slave driver who is holding his position by force and craft, and before long we have that almost ideal condition of understanding and harmony which we strive for but seldom get.

I have been accused at times of dwelling too heavily on the human factor in industry. It is entirely fitting that I should do this in a paper presented before an audience composed of men and women who are skilled in the more scientific phases of the problem, because while I can tell them

little that is new in their own direct field, I might possibly start them on trails which have heretofore been reserved for dreamers.

I can find no better way to sum up the qualities of leadership that we would like to find and develop among our workers than to quote once more those much-used lines of Kipling's:

“'E learns to do 'is watchin',
Without it showin' plain,
'E learns to save a dummy,
An' shove 'im straight ag'in.
“'E learns to check a ranker,
Who's buyin' leave to shirk,
An' he learns to make men like 'im
So they'll learn to like their work.”

CHAIRMAN: Listening to Mr. Ferry's talk, I was reminded that the selling of modern management was the same as the selling of a good business contract—it must be mutually reciprocal and concurrent; it must be simultaneous.

Our next speaker is from the State of Washington, where the I. W. W's are strong, and he has a very interesting message for us covering a class of labor with which few of us have to contend.

Mr. James C. Lindsey of Seattle, Washington, is substituting for Mr. Karl C. Griswold, who is very sick and therefore could not be with us. Mr. Griswold was to talk on “How to Secure Cooperation from the Workers,” and we are very fortunate in having Mr. Lindsey with us as he has had a wide experience along this very line.

"HOW WE OBTAINED THE CO-OPERATION OF
LONGSHOREMEN"

JAMES C. LINDSEY

Industrial Engineer, Bloedel-Donovan Lumber Co., Bellingham, Wash.
and Pacific Steamship Co. (Admiral Line) Seattle, Wash.

Ladies and Gentlemen: I thank you very much for this applause with which you welcome me. If I can call it "vociferous applause," I am going to ask Miss Doll, our efficient reporter, and Mrs. Emerson, to make careful note of the fact, so that I can get it in print and prove it to my wife. As a speechmaker I am a good deal of a joke, and when, after an occasion like this I go home and brag to my wife that I have been received with vociferous applause, she laughs at me—not with me, and I never have been able to get her to believe it. Perhaps this time if I get it in print she will believe it.

I have a feeling that I am in a run of hard luck this evening, and I am somewhat confused and worried about what I thought was a compliment. When Mr. Dent asked me to substitute for Mr. Griswold who is ill and unable to come, I demurred and acted bashful about my ability to make this speech, and Mr. Dent calmed my fears in a very complimentary way by saying that if my tongue wagged loose and my knees held steady, and I tried to stick to the truth for once in my life, I should be able to do as well, being here and on my feet, as Mr. Griswold is able to do flat on his back in Cleveland. I thought that a compliment at first, but I am beginning to worry about it.

All the members who have preceded me have read very carefully prepared speeches. Mr. Ferry has read a wonderful speech in a manner that made it sound as if it were spoken and not read. Part of my hard luck is the fact that I have no prepared speech, and another part is that the two gentlemen who have preceded me have told the whole story including everything that I had intended to say about Securing Cooperation from the Workers.

Mr. Dent told me of my place on the program a week or ten days ago, and, counting on making the usual excuses of the substitute, I did not take the trouble to prepare a formal paper, but anticipation of the task wore me out finally, and last night I sat up until the wee small hours making notes for this wholly extemporaneous speech of mine, and when they were finished I felt quite satisfied that I was fully prepared.

Now I find that I can't read the notes, and this is more hard luck. However, I will fish the notes out and keep them before me as a bluff. I can't read them, but if Miss Doll, with her stenotype machine, will play a

good loud accompaniment, perhaps I can distinguish some of them well enough to sing them.

When I speak of the experience we have had in the Northwest with the Saw Mill Man, and with the Longshoreman, I do not wish to be misunderstood to use the term "we" in its editorial sense, but in its thoroughly inclusive sense as meaning two groups of men, one at the Bloedel-Donovan Lumber Company Mills at Bellingham, Washington, consisting of Mr. J. H. Bloedel, President and Flynn, General Superintendent, Cotterall, machinist, Proctor saw filer, Riggs, a stores man, and other committeemen and workmen in the mills at that point. And at Seattle, on the Admiral Line Docks, Mr. H. C. Cantelow Assistant General Manager, Carl Strout, the Port Agent, Bert Meek, a longshoreman, our first Committee Chairman, Scotty McNally, a longshoreman, our first Committee Secretary, and other members of the committees on the docks. I shall use the term "we," although these men I have named have really done the things that have made for success in our work, and I am included only because I stood on the side lines and in cases of difference of opinion, held my breath until I could cheer the winner.

If you will permit me to brag a little, I will identify the organizations in which these things have occurred by saying that the Bloedel-Donovan Lumber Mills are the largest producers of manufactured forest products on the Coast, and that the Admiral Line is the largest operator of ships under the American Flag. So you see we have typical and very large organizations in which these committee plans, that I shall speak of, are in operation.

Mr. Palmer remarked, in introducing me, that the men in these organizations are of a type that you probably know very little about in this part of the country, but I wish to say that there is very little difference between the men we work with and the workmen here in the East, except, perhaps, a larger measure of the spirit of independence and freedom, and possibly a larger percentage of American born. Many of the men in the mills are of Scandinavian descent, but we have all races represented. The longshoremen on the docks in Seattle are just the average of American citizens in which no particular race predominates; we have all kinds. And there is nothing peculiar about them—they are all human beings, like you and me. They have rather hard reputations, that is more traditional than because it is really deserved, but when you get close to them and know them as we do, you find both groups composed of very fine fellows, whom we come to love very much on intimate acquaintance.

But let me get back to my theme again "How to Secure Cooperation from the Workers." The truth of the matter is that if you have successfully sold the idea of modern management to the executives as discussed

by Mr. Grau, and then have taken the next step, and successfully developed leaders from among the working force, as discussed by Mr. Ferry, you have accomplished your objective, and you have secured the cooperation of the workers.

Very often visitors at the docks, and formerly at the mills, have asked me how I get the cooperation of the workers, but I have not yet taken time to formulate a real answer to that question, except to say that my difficulty does not lie in that direction, but rather in getting the cooperation of the management.

While the idea may be sold to the president and to the general superintendent, or to the Assistant General Manager, and they may be ever so enthusiastic and hearty in their cooperation, it does not always follow from this that the idea is thoroughly sold to all of the minor executives, including foremen, who, as you know, are prejudiced as a class against innovations that always appear to them as diminishing their powers and personal prerogatives. They are usually quite frank in their opposition but when my efforts to secure the cooperation of the minor executives were successful, I found that the problem of getting the cooperation of the men had been solved without particular attention to that as a separate problem.

The foreman usually dies hard in his opposition to innovations. We never want to fire a foreman in order to impress upon him the value of modern methods, and occasionally we have a hard time in converting him. Installing employment plans that protect men in their jobs often results in a feeling on the part of the foreman that we have reduced his power of discipline, which the old fashioned foreman thinks so necessary in his job of getting the work done. There is a great deal of justice and a great many thoroughly established customs in support of his side of the question, so it is a big job to harmonize the attitude of minor executives with modern methods. Doubt and suspicion always exist in the minds of the average workingman towards any new thing which management advocates as a thing of benefit to both employers and employee, and the best possible method of dissipating this doubt and suspicion is to have the foremen and minor executives shown to their satisfaction the sincerity of the management, and the mutual benefit of the plans. It must never be forgotten that the foreman is the most important link in this chain of industrial relations and that the nature of his position—that of the key man—connecting link—gives him a tremendous influence over the men, which we should seek to increase rather than to destroy. This influence, rightly directed, is the best thing than can be used in getting the cooperation of the worker.

Time, and a sincere and sustained honesty of purpose, full explanations of every detail and patience with disappointing and discouraging in-

cidents, are absolutely necessary to secure the cooperation of the workmen. I think the final solution of the problem is in a combination of the right principles of employment relations and a well planned medium for their application. The medium we use is joint employee representation through elected committees of the men.

I want to say that my respect for scientific management, efficiency engineering, employment management, fatigue studies, time and motion studies, bonus wages, accurate measurement of operations and the other new methods of management, known as Industrial Engineering, is so profound that I have definitely dedicated the rest of my years to the study and dissemination of the principles that such men as Gilbreth, Taylor, Gantt, our Mr. Emerson and other leaders in these sciences, have defined for us. I have for a number of years been an earnest student of these principles because I thought I saw in them the only solution for these great and most important problems arising out of employment relations and management difficulties, but I have never felt so sure of the successful application of these principles to actual operations, as I have since my experience in the organization of shop committees in connection with my work, and especially since the publication of the report of the President's Second Industrial Conference.

I wonder how many of you have carefully studied that report? It has not had a wide circulation. The Government failed to provide funds for its publication. Most of us have seen only digests or extracts from it, but we should all have the full report and study it with all the care we give to the study of the bible. I consider it the best thing for us that has been printed since the first of Mr. Taylor's papers on Scientific Management, and my best contribution to you in this connection is my hearty recommendation of that report.

We are using the principles outlined in the report for shop committees or, as the report suggests, "Joint Organization through Employee Representation". We are proud of the fact that we had them fully installed when the report was issued and did not have to change them in any essential points to comply with the conference recommendations, and while we hope never to reach that fatuous attitude in which we shall say that we have a definite success, we are succeeding in what we have so far attempted, and we are having many evidences of success in securing the cooperation of the worker.

We are using the committees both in the Bloedel-Donovan Lumber Mills at Bellingham, and on the Admiral Line Docks at Seattle. Mr. Frank Foisie, a friend of mine, is organizing the waterfront of Seattle along the lines we found best on the Admiral Line Docks, and while their com-

mittees are more recently installed, they give every promise of as much success as we have had. It is not possible for me, in the time that this occasion gives me, to explain the details for our organization plans and methods, but we will be glad to tell you about them later if you care to have us. If you will write to Mr. Bloedel or Mr. Cantelow, or to Mr. Foisie, or to me, we will be glad to send you printed copies of our plans as we announced them to the men or to write you covering specific details.

It is quite proper that you should ask what concrete evidence we have of successful progress. We have evidence of many kinds. Labor turnover in the mills, because of customary semi-annual shut down periods lasting from two to four weeks, is abnormally high compared with conditions in your factories. In former times these men under the lure of "greener pastures on the farther hills" were in the habit of shifting jobs in the shut-down periods until it got to be second nature for them to be moving frequently. When these committees were formed in the mills there was a dwindling strike on and a picket line at the gate. The labor turnover was about twenty-five per cent per day—about 7500 per cent annual turnover. Just recently the figures show an annual rate of around 35 and 40 per cent annual turnover, which would be perfectly satisfactory, I understand, in some of your oldest and steadiest industries in this part of the country.

Our former labor turnover on the docks was one hundred per cent per day. You would call that 30,000 per cent annual turnover and it was just that. We hired the men to unload and load the ship at one shift. When they were through we paid them and fired them and did the same thing over with the next ship with another and probably entirely different crowd-mob. We couldn't call them a homogeneous group or gang. But we have stopped that. These men are now well organized into definite gangs that we employ regularly. They work for us exclusively. We see that they have good jobs and they see that we have the best service they can give us. We pay them the full scale time wages prevailing in our district and in addition to this half of what can be saved by a joint effort of the men and the management, in direct labor costs, under a carefully estimated standard. The men are so well satisfied that out of an organization of more than one hundred and fifty men we have lost but three since the first of November. Two of those were discharged by the men themselves and one for good cause by the management.

Including the bonus wage our men are earning more than the prevailing hourly wage and yet our unit cost of operation is less than the prevailing cost. This can be cited as a definite indication of success in getting the cooperation of the men because we couldn't possibly have done these things without it.

I think that about the biggest thing we have done is in the reduction of pilferage and damage to cargo. Under the old conditions of constantly changing labor this item of cost was enormous. I understand it was around \$35,000.00 per year for our company, and apparently nothing could be done about it. The men were all careless about damages. Some of the floaters who drifted in were undoubtedly thieves and it was so common to steal and get away with it that a few of the regular fellows, thoroughly honest in every respect, according to their viewpoint, had revised their code of ethics to cover a few personal prerogatives—perquisites you might call them. Panama hats were pretty cheap in our ports at one time, if you knew where to buy them. They were not stolen to sell but only to wear, but Lord knows if panama hats are folded flat there is room for more than one panama hat under one's vest if one is hungry, and no man wants to wear more than one panama hat at a time. Oranges rolling out in the hold on the deck where one is working, hot and dry, are an awful temptation to a casual laborer. The crate when emptied and broken up will go very nicely through the port hole on the off shore side. Silk shirts in a broken case are a mighty temptation especially when a hired watchman of the consciously eagle-eyed variety has just been hired from a class in the University for his vacation, and is taking it sitting on the box and looking wise and nervous. Its a fine game to hook a nail in the end of a long stick and clean out the box while he is sitting on it. Naturally the college boy watchman was peeved so he scribbled his resignation on the box and sent them up in the sling together.

My assistant, Mr. Simmons, is an old timer on the waterfront, and was at one time a checker on one of the foreign docks. He once had a discussion with one of the longshoremen about the usefulness of the gum-shoe detectives employed on those docks. The longshoreman said that the gum-shoe man was always discovered within a day or two and that they took particular delight in spoofing him. To show Simmons what he could do he brought a sewing machine out of the hold in a huge crate on his shoulder, showed it to Simmons, at Simmon's office, and then planted it at a point from which the rest of the movement off the dock was easy. Later he took it back and replaced it in the hold, and the gum-shoe detective knew nothing about it. I have heard many interesting stories of this kind and enjoyed them in a way, but the custom or practice or habit or what you may call it, was tremendously expensive to the company, and it was very necessary that it should be stopped.

It has been stopped through the cooperation of the worker. In organizing our regular gangs we did our best to select men in whom these practices were not prevalent. Then we discussed the matter with them,

told them the cost to us and how much we desired its elimination. We told them that we would never put a detective with them or a watchman over them but that we would leave it to them to solve the problem in their own way. We told them that if they caught a thief that we had inadvertently hired and put among them they could fire him themselves. We did not want our men to play the part of stool-pigeons on each other, but we did want them to throw out the thieves themselves when such men got among them—and they have done just that very thing. Pilferage of cargo in transit is taboo on the Admiral Line docks. It just simply isn't done in our social circle any more. How the taboo has been so thoroughly established, I do not know nor do I want to inquire. We put it squarely up to the men as a personal honorable request and trusted them. They simply said "leave it to us" and we did. That the taboo is very thoroughly established is well known by this time, especially by one or two "extras" who came in for a shift or two and stubbed their toes against it. They were not only shown the principle but figuratively speaking, they had their noses rubbed in it. Our Freight Claim Agent, knowing nothing of what was going on at the docks, but noticing a sudden drop in the number of short and damage reports, made a special trip to our Port Agent to inquire into the health of our short and damage report clerk. He wouldn't believe the truth of the situation until he had verified it by the lack of complaints from our shippers. This elimination of pilferage and reduction of damage to cargo is tremendously important to us and it has been accomplished entirely through the cooperation of the worker.

Rewards and records have been spoken of by the previous speakers. Of course I want to confirm what they have said. You must pay a full day's wage if you expect a full days' work. Regardless of bonus wage, or any other rewards, the basic time wage must be adequate, and the men must be satisfied with it if you are to get their active cooperation. In addition I think, of course, that there should be a bonus wage paid for a higher achievement than is expected or realized by other employers in your district. It is only fair that your men should get better pay if they do better work. In addition to this I think it is quite necessary that the men should be able to see a record of their achievements, so that the men as well as the management can have the satisfaction of knowing in exact objective terms the results of their efforts day by day, week by week. We show the men records of our achievements and this helps to prove to them that we are trying to deal justly and squarely with them. We give the workmen the fullest possible explanations of anything new that we install or attempt to install, that has anything to do with the relations of employer and employee. We keep their records in terms of man hours per ton,

and we have found that to be much better in our case than the records of cost in cents per ton, but we give them records in terms of cents per ton if they desire them.

Through our committee plans we give the men a part, on an equal basis with the management, in the making of rules or the installation of methods that have in any way to do with the employment relation, and no such rules are established without first consulting with them. We get out of this an increased cooperation, and more than that, we get assistance in our planning, out of the wonderful store of shop knowledge which these men possess, and for which these methods provide a means of expression.

I am not pretending to be able to tell you all of the ways there are to get cooperation from the workmen—no one can do that, but I can give you a small list of “don’ts” that will be valuable. If you will observe some of these then I am sure that you can avoid losing what you have of the cooperation of the workmen.

Don’t fight the unions. Don’t attempt to use a shop committee as a substitute for the men’s union; the men will naturally suspect you are doing this—they usually have, and fighting the unions will only confirm this opinion and bring you the antagonism of the majority of the men. Neither you nor I know yet whether the closed union shop or the open shop is the best solution of this labor question. There are advocates of both sides, but neither one has been proven definitely to be the superior of the other. We are working under open shop conditions on the Admiral Line Docks at Seattle. We have a committee organized and we are making slow but satisfactory progress in San Francisco, where we have a closed shop contract with the union which we recognize fully. Local conditions in each place considered, we think that this is for the best in both places.

Don’t “boob” the foreman or the minor executive. If you have better plans of management than they have used, it is probably because they have worked steadily on the job and you have had time to read and carry out investigations, mixing with your fellow industrial engineers here at these meetings, and taking advantage of opportunities they have not had. Try first to explain these things to the foremen, and if you can you should install your new methods through them rather than with their opposition.

Don’t do anything or allow anything to be done, or any situation to arise, or any plan to be installed, that will in any way interfere with the workman maintaining his self respect as he sees it—not as you see it. Human nature is naturally perverse, and any workman that is any good will fight a plan or a method that in any way directly reflects on his sense of independence and his sense of self respect. If you are to have good . . .

workmen, it is essential that these workmen should have character, and character is founded on self respect. If a man feels proud of belonging to what he thinks is a good union, that sense of pride should not be interferred with.

Don't permit the men, and above all, don't permit the outside public to look down on your occupation as disgraceful. I feel especially keen on that point, and so do our men. In Seattle, when a bum gets pinched for booze-fighting, he is usually booked as John Doe Smith, drunk and disorderly—occupation, longshoreman. Our men resent this. Investigation of a number of cases show that the individuals are not longshoremen and that the habit of booking them as such is merely founded on the fact that they may have been picked up by the police, along the waterfront.

Barnes "of New York" has written a book about the longshoremen in New York, and calls attention to this fact, and says that in his survey of social conditions the wives of longshoremen frequently gave their husband's occupation as "laborer." Also that injured longshoremen taken to the hospitals are booked as "laborers." These things seem to imply that the wives and sometimes the men themselves are ashamed of the name of their occupation and this thought has spread throughout the country. Our longshoremen are not bums. 75% of our present organizations are married. 46% of them own their own homes. A great many of them come to their work in good automobiles. In general intelligence and in skill required for good work, they are not inferior to the classical occupation used so much in our studies, the first class machinist. Their monthly earnings in our gangs are around \$190.00 to \$225.00. Yesterday I saw an article in a Chicago paper about a young student named Calhoun who has just taken the highest prize in the medical department of your University of Chicago. That boy is the son of one of our longshoremen who has been with us for many years, and he is not superior to the rest of the fellows. The boy himself has worked a great many of his school vacations on our docks in Seattle. Our men are real decent citizens and in no sense rough-neck bums. They wear the roughest kind of clothes and their badge, on the job, is usually a cargo hook in the hip pocket, but some of the men come into my office, when off the job, as well dressed as anyone in this audience.

Somewhere in these sixteen pages of "extemporaneous notes" I have a peach of a conclusion and if I could find it I would sing it to you and quit, but all I can read is the page numbers, and you may have to forego the pleasure of hearing it. My time is about up, and I can't find my peroration, but this thought continually recurs to me in talking on this subject. One could use a million words and not arrive at the real solution

if one did not use and emphasize the expression "mutual confidence." Boiled down it is all expressed in those two words. Close personal contact with your feet under the table, cards on top, face up, giving and taking honest-to-God confidences between employer and employee, will solve the problem, and your plans, complex or simple, should all be directed to that end. With this as the means, the problem of securing the cooperation of the worker has appeared to me, at times, to have reversed itself so that instead of worrying about getting their help, I have very often felt put to it to find a method by which I could repay these men in some way for hearty cooperation on their part which I felt had exceeded my own cooperation with them in their problems.

I thank you very much for your attention.

MR. C. H. SCOVELL (Scovell, Wellington & Co., Boston:) Where the executive who is capable of managing one thousand dollar men, capable of earning ten thousand dollars a year himself, and the worker who is earning from thirty to fifty dollars a week, have representation on committees and they deal with each other, the worker dealing with the ten or twelve thousand a dollar year man and with his subordinates who earn very much more than that worker, is the worker content with his ten or fifteen hundred dollars a year, and where is the line going to be drawn to say that he has a fair portion of what that plant makes? Can you bring him to a reasonable, intelligent recognition of what the twenty-thousand-dollar a year manager does as against his ten or fifteen hundred dollars? That, as I see it, is the issue.

MR. LINDSEY: Mr. Ferry, I am quite sure that Mr. Scovell was looking directly at you when he asked that question, and I think he intended that you should answer.

MR. FERRY: Evidently Mr. Lindsey wishes to avoid the answer and is somewhat of an expert in passing the buck. I am reminded that before I left the office this morning I received a "statement of principles" that have been "doped" out by a mutual friend of ours, and that subject has come up very definitely in his plan.

His proposition is a joint self-government plan in which each department elects a representative to the big council, and the management is represented with only four votes and the employees with 30 votes. That question was the first issue in the mind of the manufacturer when he decided to install the representative plan of management. He told me not long since that that thing had literally settled itself as time went on.

He said that occasionally they would get a man that had a sort of a superficial smartness, an artisan or mechanic, who had studied enough of the management of business and finance so that he thought he knew a lot

about it, who would get on his feet in one of the meetings and "spill the beans" and would raise the issue that they were not getting their share. He said, in all honesty, that that thing took care of itself, and for some reason that he couldn't altogether determine, the employees seemed to be willing to fly to the assistance of the management and explain in great detail why the management should get ten thousand as compared to the one thousand of the men.

In that plant they started out with the idea of not giving much information to the artisans. Today they are giving a lot of it and are getting great results.

(Mr. Ferry read "Statement of Principles".)

I am abusing a confidence in reading that but it struck me as being of very definite interest. I had some small interest in the original draft of that plan some eighteen months ago and I am just taking a chance with my good friend at the head of this plant because I feel that many institutions would be greatly benefited if they would get right down with their committees of employees and formulate rules and get down to brass tacks.

MR. SCOVELL: I want to draw out if the question I raised is answered by paying the prevailing rate, recognized as such, with the idea that the management makes all the money I am raising the issue that when the workmen are taken into confidence, is that issue of what the company gets settled by the prevailing rate or something else? Mr. Ferry seems to indicate that it is settled by something else.

MR. LINDSEY: I suppose I should attempt to answer Mr. Scovell's question, but seriously it seemed so all inclusive and it requires so much of an answer that I did attempt to avoid it. I will say this: The men know more about economics than they are generally given credit for. They are familiar with the commodity theory of wages in its true economic sense which is that a man's services are worth just what he can sell them for in the market for such services. The fact that a man is worth fifteen or twenty thousand dollars a year to his employer is easily founded on the other fact that he can get about that much for his services from some other organization, and that he is worth that much to his company. In other words, his wages are based on the going wage prevailing in his district just as the basic wage of the workmen. Fundamentally the workmen's daily wage is based also on the going wages established by economic conditions and by the market for his services in the surrounding district.

The workers clearly recognize three factors in industry, namely: Owners, Managers and Workmen, all this argument about "Capital and Labor" to the contrary notwithstanding. If the workmen are being paid a fair going wage, the prevailing wage, and they know that the manager is

also being paid the prevailing wage for his services, there is no jealousy or bitter feeling, they are satisfied to see the manager get fifteen thousand dollars a year, if he earns it, and they have rather definite ideas as to his ability to earn it too, better ideas and better knowledge than you ordinarily suppose. They are some times jealous and bitter if they are being paid unusually low wages and they see an incompetent man with a pull being paid extremely high wages. but this is not unnatural, and there is nothing for decent well managed organizations to fear in this. Our committees have gone through a period of rising prices and wages and again through a period of reducing prices and profits and reducing wages, and they have shown their sympathy and appreciation in both circumstances. If the company is making profits, of course the men want big wages, but there is nothing for the company to fear in that—it is only fair that they should have them. And as to the records, the men are not interested in the records of the auditor, the financial records, the intricate bookkeeping of the comptroller, they could not understand them if you showed them these books, and don't care to understand them. What they are interested in are records of their own personal achievements—direct labor costs, and you will find that by giving them this information, fully and honestly, you will establish a measure of that mutual confidence which is the greatest help in the world towards securing their cooperation.

THE CHAIRMAN: I am informed that Mr. Griswold has sent to Mr. Dent a copy of his paper and that it will be included in the printed report of the convention.

The papers and addresses are worthy of a longer discussion but as we are now past the hour for adjournment the meeting will close.

"CO-OPERATION"

KARL C. GRISWOLD

The Burkhard-Griswold Co., Cleveland

I am quite sure that when this all important subject was assigned me, no one of the committee entertained the idea that I was competent to lay down a formula which, if applied, would stimulate and maintain so great a force for constructive good.

There are so many phases of co-operation that it would require a great many years of research and of study to cover them all. In fact, it appears that up to this time the subject is so formidable that no one person has assumed the task of writing an illuminating text upon the subject, though we all agree that such text would be highly valuable.

We are all very well aware that there has been, and will continue to be, countless contributions on the subject,—some outlining specifically certain instances of how co-operation has been secured and what has been accomplished as a result. Other articles of exceedingly stimulating nature have appeared in National publications and nearly all House Organs. But none of these have fully covered the subject. Yet each have emphasized the vital need of co-operation.

As a fellow industrial engineer and one whose activities have not been confined alone to reorganizations and installations, I have come in contact with the rank and file of many organizations in quite a different way. Not as a professional outsider, but as one of the workers themselves—in fact, it is this spirit which I have endeavored to develop. It is therefore likely that my viewpoint is more in harmony with the workers than is the case with the majority of industrial engineers. Since I have nothing to sell to them, other than myself—and this once accomplished I gain their confidence by being absolutely sincere and by accomplishing for them what I have pledged myself to do—I obtained their faith in me.

In view of this I shall presume to take advantage of the professional liberties permitted between fellow professional men. I shall treat upon this subject only so far as it affects the province of the industrial engineer in his professional capacity. My remarks are to be straight from the shoulder because we should be frank.

Very recently I had the pleasure of listening to two men who are very highly identified with the industrial engineering profession, address a group of production managers. The addresses were exceedingly interesting and highly profitable, and when completed the usual privilege of asking questions was permitted. One rather pertinent question was asked:

"What, in your judgment, is the most effective way of stimulating production?"

The reply was: "Pay your employees the money and thereby get their co-operation and you in turn will get their production."

It is true that wherever we find co-operation that results are unusually high. But in the light of pay your employees the money and get their co-operation.

Is this true? Does it always happen? Does it ever happen? I am very positive in my belief that it does not.

We have just passed through an era of high wages, in fact the highest wages ever paid. Do you believe that the co-operative spirit was any more marked than it was before? Was it even normal? I am sure that it is not necessary for me to go into a lengthy discussion of the conditions which did exist. Enough examples could be cited to prove without question that labor was from 50% to 75% sub-normal, measured by pre-war standards.

Is the co-operative spirit any more marked today, where the readjustment of wages has not been applied, than it was during the pre-war and war period? Post-war conditions are most unsettled and today jobs are at a premium. Millions are without work. Has the mental attitude of the worker changed in any degree for the better?

The remark of this industrial man impressed me so strongly that it prompted the question, "How many industrial men (executives and others) actually believe that co-operation (getting men to work together, harmoniously for a common purpose) is or can be secured by money payment alone?"

Too many of this executive or employing class entertain the sordid idea that men work for money, and money alone.

Money—high wages—while desirable, never have and never will stimulate or maintain the proper co-operative attitude. True, it will stimulate a temporary enthusiasm, but it will do nothing in a permanent way unless combined with other features.

We have with us still in our great industrial America too many executive men who, like Napoleon, are disposed to believe a thing is right simply because they believe it or say so. As was expressed by Mr. Chas. Woodward, ex-president of the Cleveland Industrial Association, "The chief fault with so many organizations is that there are too many 'I guys', too many who strive to make a record for themselves at the sacrifice of everyone else. The 'I guy' is an autocrat. Autocracy died when the armistice was signed and Kaiser Bill became a refugee. The spirit of today should be 'We guys', which is democratic, the twentieth century, the winning spirit. The spirit of one for all and all for one. The one and the all always, meaning the organization.

Not long ago I talked with an executive of a very big organization with regard to large labor turnover. He was a keen business man and fully appreciated how much it cost to bring new employees into the organization constantly. He appreciated too all the disadvantages which come from a constantly changing personnel. He was compelled to build an organization quickly. One which would enable him to show certain definite results in a limited period of time, so that when that time came he would have concrete figures to prove his worthiness for being retained as General Manager at a high salary and a long contract.

To substantiate his policy of hire and fire, he argued that results could be obtained by either one of two methods. Either to secure workers who worked because they loved the organization and the work, or by taking those who applied for work and compel them to do the work for which they were engaged, through fear of losing their jobs.

Because he had to make a record quickly he preferred to hold a man's job over his head to compel him to perform,—since he could not take the time to train and fit them to the work for which they were best qualified and which they were more contented to do. He agreed that this was not constructive, but that it was expedient in this case. Do you believe that this is an unusual case? I am of the opinion that there are hundreds of such cases today. Selfishness on the part of one, wrecks the confidence and faith of thousands who are wholly dependent upon their jobs.

The important thing is, what is the effect of such a practice upon the workers? Human beings are not pawns. The unthoughtful executive has in the past been too willing to consider them as such. The workers realize this today. They revolt, and accordingly make specific demands, which if granted at all are granted reluctantly.

In all fairness it must be acknowledged that not infrequently these demands have been unreasonable. We must not lose sight of the fact, however, that the causes which prompted these demands have existed for ages,—have been revitalized through all these ages,—and like all aggravated irritations they fester and come to a head.

It is not strange that they swing to extremes since the reaction always tends to be even more demanding. It is the law of progress.

Ultimately the **means**, that which is reasonable, just and right, will become the common meeting ground, but not until faith is established.

Human nature is a mighty complex thing when one stops to consider the opinions, desires and prejudices which harbor in the minds of men. **Ideals** have not yet been standardized. Could the industrial engineer but standardize ideals and mental attitude as effectively as he can standardize operations, conditions and facilities, all industrial problems would be solved.

If men could but be stimulated to feel "that our organization is a good one"—"that our men are good men," and "that our product is the best of its kind" and "our whole-souled ideal is to make all better." Nothing could conquer such a spirit and there is no obstacle which such a spirit cannot surmount.

It is unfortunate that the industrial engineer has not given more time and attention to the psychological side of his profession. Without question this is the most vitally important function of the profession. Yet, usually, the least considered. The chief fault with the profession lies in that we seem to have been more concerned in commercializing it than we have in properly equipping the men who enter the field. "Get the job, keep it sold if you possibly can, after you once get it" seems to be the policy. Not by all, but by some of the profession.

The result is that not only have the officers of firms lost confidence, but employees of these firms have lost faith in the very agent which should have kept faith with them.

In our field of work we constantly emphasize "deal in fundamentals. Get to the root of the causes of all effects, and apply the remedy, cure the disease once and for all."

Why not look within our own circle and deal in causes, not effects? To prosper we need the confidence of management. We need the faith of the management and of the worker, without which we are doomed ultimately. We need to co-operate fully, unstintedly, with management and the workers. It cannot be questioned that we need the whole-hearted co-operation of both to competently solve industrial problems, for the mutual benefit of all. It is only by careful analysis that we can get to the root of troubles. It is only by analysis that we can get to the causes. It is only by getting into the heart of men that the proper remedy can be applied to bring about a co-operative attitude.

There are three prime factors which must always be considered to secure co-operation.

Money payment. (Incentives)

Physical facilities. (Standardization)

Faith. (Inspiration, belief in.)

No one of these factors can be disregarded if the desired mental attitude is to be developed to the proper degree.

To bring about the desired co-operative results, corrective measures must be applied in all instances wherein any of these causes are violated or disregarded. If the method of remuneration is not just, and does not provide an incentive in the form of a bonus or premium for applied energy, a suitable method must be developed or applied.

If the physical facilities are poor they must be corrected. If faith is lacking, the policies of the firm in the handling of the workers must be intelligently remodeled, so as to instill faith.

I am reminded of the conditions which existed in the plant of one of our clients. The wages were very high, the equipment modern, but the facilities were exceedingly bad. The workers had no faith in the management, nor had the management in the workers. The management proudly exhibited its records of earnings and of increase in volume during its four years of existence in business. Yet it was daily perplexed as to whether its full complement of men would report for work each morning. The management could not, or would not, understand why the workers didn't appreciate their jobs. Quite another situation existed with another client where rates of pay were high, the product was highly standardized, as were the manufacturing processes. The facilities were quite ideal, yet the co-operative spirit was sub-normal and all because the workers had no faith in the management. The management assumed that the help was unappreciative. In the second instance we find "ideal physical facilities" plus "a scientifically developed and just remuneration plan." Yet the desired result was not secured. Co-operation was entirely lacking.

This example can be multiplied a hundred fold throughout this broad industrial land of ours. Faith is lacking. Labor is arbitrary because it has lost faith. Management is arbitrary because it has lost faith.

A worker who has faith in his firm, in his boss and in his job, is a man inspired.

A man inspired can and does work harmoniously with head, heart and body. He thinks right, feels right. And is right after his job, and his success in that job.

Everywhere, generally speaking, there have been influences which have tended to cause labor to lose faith in capital and management. This is likewise true of capital and management in labor, and with the spirit existing there can be no real co-operation. The industrial engineer has a real purpose to perform under these existing conditions. His duty is not to confine himself alone to re-organizations and the perfecting of the physical facilities. To be sure, the technical side is all very important; it is not, however, a complete solution of the industrial problem.

Labor thinks capital is always trying to oppress it and capital is not quite so bad as that. Capital always, or nearly always, thinks that labor is trying to avoid work—to make conditions difficult for directing minds, but labor is not so foolish as that. There is no doubt but that labor has been the scape goat. Both have lost faith in each other, and so long as this exists there can be no real co-operation.

It is said that men in making a decision are influenced not by what they think but rather by how they feel. Particularly is this true of the workers—they constitute the great mass, and the feeling of the masses always dictates, on the premise that everybody knows more than anybody.

Faith is a quality of the feelings. Faith is the backbone of co-operation, it is the foundation. Destroy the foundation and you ruin the whole structure.

Our professional problem is a big one. I say problem with careful deliberation because there is just one problem. "Doing everything within our power to stimulate and maintain co-operation within industrial plants, as well as co-operating with them ourselves." Truly the problem is a knotty one. It is a far more difficult problem than the many complicated physical problems which come before us constantly. It does not demand the fine technical knowledge which the majority of shop problems require. It cannot be gauged by a slide rule nor solved by mathematical formula. It is made the more difficult because of the great variable human element, the mind, the most complex mechanism in the world; the master mechanism whose judgments are not always logical because of emotional influences. The influences must be considered. How well we can meet the situation depends entirely upon motives.

The major motives behind human industry are three:

1. Ambition
2. Love of work
3. Desire to perform some great and good service.

The first motive is the third law of human nature. It is that vitalizing influence which prompts man to do something, to strive to accomplish, to acquire for the glory of self. It is a thoroughly selfish motive, yet laudable, since no one can attain the two following degrees without first having passed through the first. It is while man is in this stage that most of the misunderstandings occur. He cannot see anything beyond the sphere of self. Some men unfortunately never pass beyond this stage, and misunderstandings continue. This does not necessarily measure business capacity but it does measure human bigness. A man driven by ambition alone may accomplish much in a material way, but this does not prove bigness of heart or of ideals. He is striving for personal success alone. He is concerned with no one else except so far as it may serve him.

The second stage is that of love of the work. When this is the driving motive self is secondary. Self is overshadowed by the all consuming desire to do the work well, because of the sheer joy of doing it thoroughly. This is foremost. It is at this point that the human being begins to make noted progress in his career.

It is only when the third degree—the desire to perform some great and noble service—becomes the driving motive, can it be said that a man is truly great.

The profession of industrial engineering is truly a great profession. It has great purposes to fulfill but it can accomplish these purposes successfully only when the motives of the men who constitute its personnel become a whole-souled desire to render a great and useful service. With this as the motive, faith will be re-vitalized, re-nerved. Faith inspires. We can then become the arbiter of all industrial problems.

Idealistic—? Yes! There is such a thing as practical idealism. Emerson says that the first principle of efficiency is ideals,—and it is.

The supreme ideal of human nature is **faith**. From infancy it abides in our hearts until shattered by the influences of materialistic men,—men whose life motives have not evolved to the stage of desiring to perform some great and good service.

THURSDAY AFTERNOON SESSION

April 28, 1921

Production Group

"STANDARDIZATION"

Chairman: JAMES J. MARTINDALE

Vice President James E. Morrison & Co., Detroit

THE CHAIRMAN: Ladies and gentlemen, members of The Society of Industrial Engineers and guests, it is certainly a pleasure to be with you at a meeting where Standardization is to be discussed. In my opinion, Standardization if logically and practically developed, can do much toward remedying some of the ills which now beset American business. Further, if standardization had been more in effect prior to the entry of the United States into the world war, our participation, altho most glorious, valuable and timely, would have been much more valuable because we would have reached our productive stride so much earlier.

Those who heard Mr. Wallace's address and Mr. Emerson's suggestions yesterday, realize the value of Standardization. I want to take a few minutes to emphasize some of the important subdivisions under our topic "Standardization." This topic is divided into two main divisions. One is "Production" and the other "Methods."

Under "Production" the first sub-heading of interest is "industry." Is it too much of an idealistic dream to think of or look forward to some central organization or bureau to which one might refer for advice as to the best location of a plant? Without a doubt any of you can go back in your memory and think of some plants which would have been a success if they had been in some other location. Can we not assume that some plants which today have made a success could turn out their products still more cheaply, if they had been in another location?

A dream I have often had is that of a combination of plants. It is being done and it is nothing new, but I do not believe it is being done as much as it might be. Without discussing the point where restraint of trade begins and where it stops, there is considerable opportunity for the combining of four or five plants, all making a series of similar articles. If this were done, the economy obtained in standardizing production by manufacturing just one article in each plant, would be great. For instance, Plant A would manufacture article No. 1, plant B would manufacture article No. 2, and plant C would manufacture article No. 3, rather than all the plants manufacturing all the articles.

Product. The standardization of "product" or setting up of standards covering the products of manufacture has been done somewhat generally. There is a great deal yet to be done. In Mr. Wallace's address you heard of what had been accomplished in the standardization of buggy axles, tires, etc. He also spoke about the standardization of seasonal production and what that would mean.

I have here an advertisement taken out of the "Detroit Free Press" under date of April 12th—I presume a great number of you have seen it as it appears to be a national advertisement—in which the paper industry announces a standardization of their product with the idea of eliminating unnecessary grades, weights, sizes, colors and water-marks. It is that kind of standardization which many industries need. Is it present in the wood-working industry? Is it present in the canvas industry and other industries?

Material. The type and kind of material with reference to design and use to which that material is to be put should be standardized. It always appeared to me that furniture might become more standardized than it is, and in talking about furniture I do not wish you to infer that I am talking about the spindly-legged chairs on which our wives tell us we cannot sit for fear of breaking them, or the sofa which was just made for looks. I am talking about the chair that is supposedly built for good service.

Let me give you an illustration. We have four children at home and we have had two baby carriages. We thought we had bought a good carriage in our last purchase. I know we bought the best there was without buying any fancy decorations, but every time I think of it, it reminds me of an unballasted schooner under full sail in a rough sea—it is top heavy. The handle which should have great strength, due to the necessity of taking the baby carriage up and down the steps, has become broken; the nicely nicked nuts on the ends are off, the handle catches the pockets of the Father and the dress of the Mother and rather too frequently occasion words which the baby should not hear. I do not mean that only baby carriages should be standardized. I merely give that as an illustration.

Art should not be forgotten. It occupies a big place. It certainly helps to sell the goods, but I believe that stability of the article or standardization regarding its use should come first. I am of the opinion Art is realizing that more and more.

Accomplishments. So many plants measure their accomplishments in units such as tons, dozens, gross, etc. Yet, these figures are in many cases not comparable. A manager will say he had fifty more tons output this month than last. Upon questioning we find he will admit this month's

product is simpler to manufacture due to lesser number of operations. He estimates this qualification amounts to twenty tons, therefore the organization should pat itself on the back to the extent of thirty tons.

If managers would only realize they have a comparable figure in that of Standard Hours which, if developed, can be used to show up the true conditions, I believe Standard Hours as a measure would be more universally in vogue. One realizes that fifty tons of copper rolled down to .5 inch is the same output as 50 tons of copper rolled down to .005", but the second output requires more operations, therefore more Standard Hours. Some managers have failed to realize this. They will censure the organization when the cause is really not present and praise it when praise is unmerited. In other words, the basis of true comparative measure was not standardized.

Methods. Under "methods" we might deal with the "operation" as probably a first sub-heading. I believe we need a standardized method of developing classification of parts, or symbolization.

Equipment, Tools, Plant Layout, etc. These have had much written about them as regards standardization. This information is available to all of us and it is probably unnecessary to enter into a discussion on these points.

Employment. I believe there is great need for standardization of employment methods and records. Last Fall at the Pittsburgh Convention of The Society of Industrial Engineers, Mr. Henry C. Metcalf gave a most admirable paper on the "Training of Personnel Administrators as a Solution of the Labor Problem." It appears to me, he has attacked the problem in the right manner. If management had a standardized classification as to the necessary characteristics and requirements of an employment manager and would use such a classification in its selection of the employment manager, I believe our methods would become standardized. Such a basis would not detract from the individuality of the employment head or the application of methods peculiar to the requirements of the plant.

Unemployment. Mr. Hoover's articles have brought to our attention very forcibly the need for standardized contact between labor and unemployment. That embraces quite a number of phases and it is a most interesting subject. Here is an appealing phase. Let us assume that a plant is manufacturing in a town of small proportions, the only plant we will say of any size. They have three hundred employees and contemplate the installation of labor saving equipment which in their estimation would eliminate twenty percent or sixty employees. Unless the installation of that labor saving machinery is handled properly you can imagine the possible hardships that would be inflicted upon the sixty people and

their families. If the proprietor cannot place them in other jobs in his own shop he should be in contact with neighboring cities and see that these people secure employment and such a transfer should be handled gradually, with due regard for the persons affected.

Classification of Labor as to Rates. This is a very big question. A set of Minimum wage rates are, I believe, something that all would like to see. I imagine we haven't many sweat-shops in the country, at least we do not want any more. They helped Trotsky further some of his ideas. A minimum wage rate will help to prevent them, but what would be the basis of such a wage-rate? It undoubtedly should embody some of the well known index figures, such as that of the Department of Labor, as well as national and international conditions, local conditions, type of skill, physical requirements, etc. What relation has one factor to another? Who is going to develop them and how often?

These, ladies and gentlemen, are some of the high spots that can be touched in this meeting. It is my opinion if this discussion is handled in a cooperative manner, some valuable guiding thoughts will be developed which will help the Society in its endeavor to place American Industry where it belongs and keep it there.

As I mentioned to you before, the meeting will be divided into two parts. A speaker will lead each discussion and at the close of the leader's talk the meeting will be open for general discussion. Those of you who are members of The Society of Industrial Engineers and attend our local meetings know that the most valuable meetings are those where the discussion is general. I hope you will feel free to get up and talk, give your experience and give your thoughts. That will make the meeting valuable to us all.

The Leader of the discussion on "Production" will be Mr. C. H. Benedict of the Vollrath Co., Sheboygan, Wisconsin. I take great pleasure in introducing Mr. Benedict. (Applause.)



"SOME THOUGHTS ON STANDARDIZATION OF PRODUCTION"

C. H. BENEDICT

The Vollrath Company, Sheboygan, Wis.

Production is the primary necessity of life. It is also the first consideration of industry.

Life in this world has always been, and is today, molded by the law of the survival of the fittest. Were it not for the fact that what is most fit today is sure to be superseded by something more fit tomorrow, next year, or in the centuries following, life would be at a stand still, and with it production.

Standardization is the force which selects that which is most fit and attempts to perpetuate it. Its function ends and again automatically begins when something better for the purpose is developed. Many of us have, no doubt, been approached with the argument that standardization tends to make puppets of men. This is never true. However, it always tends to separate the men who are puppets from those who are not. If the man recognizes that what is standardized as best today will in time be superseded by something better, and makes a persistent, determined effort to himself develop that which is better, he will never become the tool of others. Any man, who undertakes as his life's work the subject of Standardization of Production, must have neither hope nor fear that it will be finished before he is called upon to leave it. The best that he can do is to carry on and improve.

Industry, as conducted today, shows most clearly the effects of the force of standardization and also the futility of hope of permanency of conditions to be obtained by it. Before the years of the World War, efforts toward standardization in industry had produced conditions, which, in the minds of many of us, were fixed. Demands, brought about by the requirements for war purposes, entirely upset these ideas, and called forth an effort toward standardization along lines which before had been unthought of. At the present time the argument is put forward that the war has destroyed our standards and we must regain them. We must, but they will not be those of the time before the war. There will be new standards to meet the new requirements of the forces of production.

Localities, which have heretofore participated in types of industry and prospered, will of necessity make changes in their types or lose their position in the organization of industry. The development of a national body to undertake better standardization of the geographic location of industries is not an impossibility. Do you not think that such a movement, if it rec-

ognizes the continual changing trend of life in all localities and persistently follows these changes, would perhaps become an asset upon the balance sheet of Industry.

Surroundings of life determine the products of industry, and, again, the products of industry mold conditions of life. Efforts toward Standardization of Production must recognize this fact in order to be really successful. Ford has demonstrated this most clearly with his automobile. It was patterned and its design standardized to fit into the lives of the largest class of people, and has in turn produced tremendous changes in their methods of living. Even Ford will find it necessary to change his standards of design to keep in adjustment.

If the product be one whose use is controlled by persons engaged in a large variety of different occupations, representing a multitude of individual tendencies, each aiming to accomplish a different purpose, its standardization is subject to a type of criticism, which is more varied and more rapidly changing in nature than would be that of a product whose use is controlled by a group who are trained to think and work along similar lines. The manufacturer of hats receives comments upon his product of an altogether different nature than does the man who makes wrenches. The one finds it impossible to meet the demands of his consumers with a standard article, because they have no definite trend of purpose. He, therefore, reverts to styles which are constantly changing. The other, by taking advantage of the direction of the criticisms, reaches a standard product and is safe in holding to it.

That Nation is most successful which understands and meets the needs of its people in as constant a manner as possible. Likewise, an industry, whether it be national or local, grows in proportion as it listens to and takes advantage of the comments of the users of its product, whether they be favorable or unfavorable. The man who calls on your customers, call him a salesman if you like, is of a different type than he was twenty years ago. At that time he depended upon his personal appeal to place your goods and trusted to luck that they fulfill their purpose. Today he has a different method of approach. If he is a good representative, he will place only such goods as in his judgment will fulfill the requirements for which they are purchased. Industries, which take full advantage of this tendency and develop through their representatives a knowledge of the requirements of the users of their products, which even their customers do not now have, will reach the head of their class, will drop items of their own line which are unsuitable, and will force from the market unnecessary competitive duplication of items which now exists. Standardization of Product is a development to be obtained by an intensive cooperation with the consumers

rather than by attempted understandings or agreements between competitors.

The materials of Production are of three classes. These are the products of nature, the products of industry, and the products of nature developed by industry. We have no hand in the standardization of the first except in the sense of the best application to the particular industrial. Nature may or may not be a force in the development of the second. In case she is, we will be successful in the standardization only as we understand and cooperate with her forces in making the product most suitable for its use. Human effort is in the third class and is subject to standardization only as it understands and is directed by the requirements and workings of its undertakings.

Much has been said and written about the organization and standardization of the tangible elements of the human being. We all agree that nature has well provided for us in our tangible make-up, but she has even better provided for us in giving us an intangible make-up, which it is beyond our most persistent efforts to even analyze, to say nothing of standardizing. It is these intangible features, our likes, our dislikes, and our desires, which have developed human effort as it is today. They have made it the controlling material in the products of industry.

A budget is usually understood to take into consideration a general financial condition with proposed measures, which will effect this condition for a certain time in the future. A budget for production could be understood to be a view of what we have with which to produce, together with what we propose to produce from it over a period of time. The standardization of this feature of production is one on which much energy has already been spent. Lack of it in the past has been the cause of financial panics, which business has experienced from time to time. Our Federal Reserve System has already proven to us what a nationally standardized effort in this direction will do. Local effort in the same direction in the individual industry will do as much to avert a panic therein.

Modern accounting and expense apportionment alone will not accomplish this purpose. The budget must take into consideration items which are not represented upon a financial balance sheet. Such statements always contain things which we do not have and leave off expenditures which have already been made. What statement of assets is there which will not be discounted when you intensively compare the represented value of items which would be most fit for the purpose in mind. Again, what list of liabilities includes expenditures already charged against the industrial by the purchasers of its products on account of their unfitness for the uses to which they are put. The standardization of a budget for production

must include a consideration of these items, as well as the usual financial apportionment in order to truly represent the measures proposed.

The accomplishment of production is in proportion to the degree of satisfaction it gives to the likes, dislikes, and desires of the people whom it serves. These are the owners, managers, employees, and consumers. Standardization of this feature leads to planning and organization of Methods of Procedure. Successful results of this are clearly shown by such combines as the U. S. Steel Corporation, the Standard Oil Co., and the Packing industries. Criticisms made against such organizations have always been caused by the lack of impartial consideration of the just desires of all the classes which they serve, rather than by the results of their efforts toward standardization.

We are successful of productive accomplishment only in so far as we produce what is desired by the users of our product. Therefore, to reach standardization of accomplishment of production, we must obtain a thorough knowledge of the exact desires, likes, and dislikes of the users of the product whatever this product may be.

THE CHAIRMAN: Gentlemen, the meeting will be open for discussion on any phase with reference to production. There is one interesting part of standardization which I do not think Mr. Benedict touched. This deals with the Standardization of accomplishments of an industry so that the component parts or the members of the industry have access to such standards.

Probably the most illuminating case I have in mind is that in connection with Cleveland. I understand that the Clothing Union and the Clothing Employers' Association got together and decided there should be a development of Standards covering the operations in the clothing industry—the sewing of the seams, the binding, etc.—such Standard Times when obtained, to be accessible to the members of the Association. These standards are to be used as a measure for the establishment of piece-rates.

There are two interesting phases of that situation—One, the getting together of labor and management for a common purpose. Second—the development of a standardized method of rate setting for the industry at large in Cleveland. I can well appreciate if that was followed out in many industries, those in professional life might not have so many jobs as they would if each plant paid for the service to get its own standards. But that is the way it should be done if it is practicable and, of course, in some cases it might not be. Is there any one who can give us more information in regard to that case?

Mr. William B. Ferguson of Philadelphia expected to be here but he was unable to come. He prepared some remarks and I believe he has

asked Mr. Rein of Philadelphia to read them. I take great pleasure in introducing Mr. Frederick Rein.

"STANDARDIZATION"

WILLIAM B. FERGUSON

Philadelphia Engineering & Sale Corp., Philadelphia

The economic benefits to industry as a whole from standardizing, (as far as practicable and really desirable,) the design of products used in large quantities, can hardly be over-estimated. Like all production problems, the first requisite for selling the idea on a big scale to consumers, users and manufacturers and getting their real co-operation, is to ascertain the facts and set up the figures and what they mean in such a way to impress us all with the present wasted effort and under-production due to:

1st, Making products on "order" only,—the sell-and-make policy,—where it is not safe to manufacture any quantity of goods for stock, due to uncertain later demand for any particular design, model or style.

2nd, Making products in small lots of one kind, at a much greater unit cost, which difference in cost can be determined fairly closely,—as between one unit, twenty units, one hundred units or ten thousand units.

The "facts" to be ascertained, then, upon which to make a case that will appeal to the users and manufacturers because of its magnitude, should include a comprehensive array of products to which standardization of design and materials can be intelligently applied by all co-operating, bearing in mind that there are limitations in practice which cannot and ought not to be overcome. For example, in 1920 a large factory which specializes on making locomotives, and which has a capacity of over 3500 locomotives a year, had to manufacture about 500 different designs or models in order to fill the orders from the various railroads for 1500 locomotives. Supposing that 100 different models were determined to be sufficient to satisfy the trade, this would mean manufacturing in average lots of 12 instead of 3, and a possibility of increasing the output per employee from 25 to 50 per cent.

A collection of facts on such products as street cars would show surprising "waste" in effort, and when the automotive industry is tackled, and the varieties of design for trucks, tractors and automobiles studied, it would show the possibilities of standardization of parts and of redistributing the manufacturing,—if such a thing were viewed from a national standpoint,—so as to benefit by quantity production methods.

With such research work conducted on a big scale, possibly by co-operation between the Department of Commerce, manufacturers, trade associations and the public (users and consumers,) the facts would be established to show the present great national waste due to lack of standardization. My studies of one industry alone lead me to believe that billions are wasted annually.

The limitations must always be recognized, for the advantages of stimulating originality or improvements, and of developing individual initiative, are manifold; and what is "standard" today, or the best we know, may be (and should perhaps be) obsolete twenty years from now.

Again, the "human element" has to be recognized in every user, as we do not like to have a standard forced upon us. I have been wearing white socks for ten years, ever since I wore my feet sore in Cuba on the stone floors of the houses with the standard black socks, and it has been impossible so far for my friends to persuade me that I am foolish not to be standard or in style, and go back to civilized black socks..

MR. LEON I. THOMAS (Factory Magazine): I had the pleasure recently of studying what different concerns are doing with standardization and I came across one thing which seems to me to be worth while mentioning and that is: If there is any subject in management that requires a greater co-operation between departments outside of the production department than standardization, I do not know what it is.

It is all very well for the production department to secure the benefits of standardization, but the sales department, the finance department, and other departments are also involved—they are vitally affected. Therefore those concerns which seem to have succeeded most were those that have had a policy regarding standardization. It is understood that from the financial, sales and production side it is not easy to standardize, but it is a thing that has paid wonderfully well where it has been brought about.

The Plumb Company of Philadelphia, maker of hand tools, have gone a long way in this regard and they tell me it took an enormous amount of courage to go before their sales force and say: "We will not make this, that, and the other article in our line," and yet they have put it over after a long amount of effort and find it pays wonderfully well. They adopted an arbitrary standard, took an arbitrary ruling as to what they would throw out and what they would not. As a basis, they said: "If we cannot sell in one year one day's run on a particular item we will throw out that line." Now Mr. Plumb in explanation said: "You would naturally

think that would involve very few items and yet when we began to study the matter we were amazed at the number of items to be thrown out under that rule. There were dozens and dozens to be discarded and yet they have succeeded in throwing them out and have kept up the sales."

The matter of standardizing finishes has been worked out by a number of concerns. The Plumb Company is one which had a number of finishes on tools, including a great deal of nickel-plating. During the war they reduced everything to the rough finish. Since the war, instead of sliding back to the nickel-plating and other various kinds of plating they have smoothed out the rough finish for the new finish. They have cut out an enormous amount of various finishes and reduced them to a few standards with no appreciable effect on sales.

There is just one other thing I should like to mention which will make a vast difference in the cost of the product: If a man asks whether the factory can make a certain thing for him, instead of saying: "Sure, we can make it!" he should see if he can secure something which is standard first.

MR. LEFFINGWELL (Leffingwell-Ream Co., Chicago): I think it is rather a waste of time for a lot of engineers to get together and try to convince each other that standardization is a good thing. We all know it is a good thing, but it seems as though we have got to argue with each other for a long period of time before we reason it out and do something about it. Standardization, we are all agreed, will make a tremendous difference in the productive methods of this country. We all know that the original hammer used by our stone age ancestors was merely a stone which was held in the hand and it took them hundreds of thousands of years to learn how more useful it would become by placing a handle on it. I can imagine some of our ancestors argued a long time as to whether it would be wise to tie a stick on it or not, but after they tied it to the stone they made big progress—the handle never came off the stone after that.

During the War we had a lot of things which were brought up and forced on the public attention by propaganda. We forced people into action and we didn't force them into action by making intellectual appeals to them. We told them about it and tried to arouse all their emotions on this question.

I think that The Society of Industrial Engineers ought to get together and start some real live propaganda on Standardization. With our several hundreds of members making a concerted effort, gathering together

statistics, facts and selling arguments, selling standardization and organizing Standardization Committees, I believe great progress can be made. But if we continue to get together and continue to agree with each other for ten years that Standardization is a good thing, we shall not accomplish very much. I thank you. (Applause)

MR. FRANK B. GILBRETH: Mr. Chairman, ladies and gentlemen, I want to endorse what Mr. Leffingwell has said. I have just come back from abroad, the second trip in the last six months, and I have had a most exceptional opportunity to see what is going on.

I said the same thing last night that I am going to say now because I think it is important enough to say the second time if there is one man in the room that didn't hear it. I want to say that we made the first talking machine in this country, the first submarine, and the first airplane, and the first lot of things, but it remained for the people abroad to develop them. You know what they have done without my telling you.

We have made the start on scientific management in which standardization is the principal thing and I can tell you and Mr. Farnham can tell you that propaganda is abroad today saying that all factories in America are running on scientific management and therefore they must get a move on. I want to tell you that all factories abroad are thinking about scientific management and we have got to get a move on. There is no one thing that will do so much good as what my friend, Mr. Leffingwell, has said—to sell this idea of Standardization. I have in my possession now, but not for publication yet, national standards that I have brought back with me from abroad, and when I tell you that they have done a job on Standardization that we have not touched and we were the first to start it, you will realize that it is time for action.

In the few moments I am to speak here, Mr. Chairman, I cannot say all that I want to say but I want to push this standardization and the idea of Mr. Leffingwell as much as possible, because I have been behind the scenes abroad and know what is going on. I have seen enough to tell you that we are not on the job. We have got the start and do not know it and as usual we have got to be properly licked before we wake up. (Applause)

Who is in favor of the metric system in this country? Everybody except a small group of tool builders who have already made some inch standards. It is not for me to boost the metric system because my case is not fair. I happened to learn the metric system before I learned my feet and inches. That is a peculiar situation. I should like to discuss it but I am prejudiced. The only propaganda against the metric system

comes from a few tool builders and a few others and they will tell you with glee how at a recent meeting \$132.42 was raised to put over the metric system in America. (Laughter)

Let us see if we can show the benefits of the metric system. There is no disadvantage excepting the cost. I know there are good tool builders in the room that will go to the mat with me on this because they have spent their money in the interest of standardization of a foolish measurement, the inch. Let us meet them half way and say that this Society will not interfere with the inch at present. We will not promise not to interfere with it. Their only argument is that the inch is better, but certainly there can be no argument about the rod, perch, stone, grain, hundred-weight, long ton, short ton, fat ton, thin ton, metric ton and all the other kinds of tons; scruple, lines, 40 lines to the inch, and I do not need to tell you the fifty-seven different kinds of bushels, pecks, quarts, etc. Why not adopt the metric system for all weights and measures—dry, liquid and mass—and let the inch alone at the present time?

One of the greatest men against the metric system said to me: "Gillbreth, if we let you fellows get your foot inside the door it would be no time before you would get the door open." In France, England, Austria, in Germany where the great engineers are, whether you like them or not, the standards made on the metric system are so numerous that there is no comparison.

If the Society means business on this standardization I should like to bring to their attention the scheme of adopting the metric volume weight, liquid, dry measure as the units that this Society use, regardless of whether our great president Mr. Wallace, with his great committee of great engineers are able to come over the full distance with the metric system.

I want to know why we cannot have the metric system on the bushel, peck, quart, scruple, grain, long ton and short ton, and all other fool methods? There isn't any reason. The standards made on this metric system are astounding and I have copies of it and a few united tool builders are for my scalp and your scalp. The reason many good men are against it is because they do not know what it is. I interviewed many great men while abroad about this matter and not one word was said against it. There is no argument against it except the cost of the change and the cost of that change is the cost to the tool builders, and if it is going to wreck them we should make arrangements whereby they are not wrecked and we must not wait until this is postponed and we are beaten because we have delayed in making the change. My time is up: I have more to say. (Applause.)

MR. NATHAN: I think as an active member of the Society of Automotive Engineers I ought to inform The Society of Industrial Engineers that the standardization work which we have followed for more than six years has permitted of no argument there as to the desirability of standardization—it has been a fact. One of the most important bits of work which the Society does is standardization work. At present there is a very large committee and subcommittees on this work. They have frequent meetings of the committee as a whole and of their subdivisions. I might read you a few of the subdivisions of it: There are motors, frames, springs, electrical equipment, accessories, wheels, rims and tires, trucks, tractors, motorcycles, etc.

The wheels, rims and tires division cooperated with the government in the war in bringing down the size of tires to a few which were mentioned yesterday. There is now some active standardization work in the matter of hubs. It is a small item but it is an important one because the axle builders have hundreds of hub designs to manufacture and we have brought it down to a few sensible sizes. I think if the Society wants some information on how the automotive engineers have gone ahead with this, the automotive engineers will be glad to co-operate. They have also done some remarkable work in connection with the government in the matter of ordnance trucks, the Type "B" truck, and ordnance tractors—they have been standardized to a very fine degree.

I think this is important work. There is no argument. We feel that we have made some great strides already and those who follow will realize the advantages which have been gained by our work in this matter.

MR. H. P. LOSELY: My experience has been opposite to that of Mr. Gilbreth. I first learned all the inch, pound and gallon intricacies; later I used the metric system for several years, and when, five years ago, I had to get back to our old weights and measures, the great contrast in efficiency was too aggravating for words. I appreciate the tool builders' propaganda and am strongly in favor of Mr. Gilbreth's suggestion. I think if we had some discussion and action on this, it would be most profitable.

THE CHAIRMAN: If you will kindly pardon my interruption to the discussion at this time, I believe we should hear Mr. Jones' paper. This will not stop this discussion except temporarily and after hearing Mr. Jones, the discussion can be renewed. Therefore unless there is any objection, I will introduce Mr. Jones. I take pleasure in introducing Mr. Harold F. Jones of Leffingwell-Ream Company, Chicago.

"STANDARDIZATION OF METHODS"

HAROLD F. JONES

Chicago

"Standardization" means the act or fact of establishing by authority that which is correct, best or in common use.

"Methods" signifies the ready or right way to do a thing. A method is the utilization of rules or principles according to a predetermined arrangement.

"Standardization of Methods" means the act or fact of establishing the correct means to an end by utilizing rules and principles according to a predetermined arrangement.

Fundamentally, industry is not organized for the development of science. Prosperous and weak organizations reluctantly desert a proven method regardless of the economic, theoretical or practical soundness of the substitute suggested.

Industry is not idealistic. Problems are solved to overcome existing difficulties. The ideal is seldom set up as a goal towards which changes must proceed.

Progress over a long period of time has developed economic laws. To these the Science of Management has contributed the transfer of skill, the division of labor, the specialization of men and others.

"Standardization of Methods" are not as clearly defined as the economic laws. Tendencies in several of the major Industrial Engineering problems however seem to indicate the eventual result.

Location of an Industry

One of the first problems of a new and amply financed industry is to secure a location. Until recently the purpose of the home was not a major part of the considerations. Lists of available sites were secured. In some not clearly defined manner those that were not large enough for present requirements were eliminated. The price and terms of purchase of the remaining sites was considered and a location determined.

Manufacturing processes determines the type, kind and size of building requirements. The present requirements and the probable future growth of the industry establishes the size of the site, its general contour, outline and special requirements. Its location is considered in connection with raw and finished material markets, transportation facilities, freight rates and labor supply.

With this information at hand sites that will meet the specifications are sought. The cost of doing business on the available sites is compared with

price and terms of purchase and after this analysis the location is selected.

Housing An Industry

The housing of an industry affects manufacturing efficiency. Walls and a roof intact will not fully meet the requirements of modern manufacturing. Industries have been fitted to buildings with consequent loss in manufacturing efficiencies. The existing buildings of the older industries are mute evidence of the little consideration given type of construction, lighting, ventilation, fitness for the peculiar requirements of the industry, expansion and the locating of the buildings on the site.

Manufacturing buildings are erected to serve the operations incident to the industry. Each industry has certain requirements which must be met if maximum return on invested capital is to be secured. The contemplated output of the plant and the manufacturing processes determines the necessary equipment. The manufacturing methods, the necessary equipment and the location of the manufacturing operations determines the plant's size. The plant's area and the contemplated future growth determines the location of the buildings on the site. A plan for department expansion and general future growth will eliminate the possibility of competition based upon an efficiently arranged plant.

Standards

The basis of labor cost per unit of product is the number of pieces produced per unit of time per unit of producer. The item of producer can be easily controlled. The number of pieces produced per unit of time is difficult to control.

Under the old plan of plant departmentalization, the output is directly dependent upon the department executive. Management witnessed increase in production by securing new men. Different men performing the same work secured the same result by using widely different methods. These facts and the necessity for a means to determine efficiencies brought into being measures or gauges for manufacturing efforts. These measures or gauges were called standards.

The basis of standards are past performance, analysis of methods and operations, and time and motion studies. Standards provide a means for control; actual and correct output can be compared. They measure efficiencies.

Standard Practice Instructions

In absolute monarchies, laws are for general guidance. The seriousness of an offence is determined by the ruler's pleasure. This arbitrary ruler existed in the old form of business organizations. Under the old "rule-of-thumb" management we did not find standard practice instructions were used. The decision of the boss was final, yet his decisions on similar cases varied.

Functional management has eliminated arbitrary decisions in industry. Extensive research investigations of manufacturing processes have been made. Standard practice instructions have been made from these intensive investigations. They are based upon what has been determined as the correct procedure or "the one best way". By their use, management controls operations.

Business secured its original ideas of organization from the military. The basis of operation was an individual. This person was the court of last resort in all plant matters.

Management under such an organization was based in great part upon fear. The instructions of "the boss" were unquestioned.

Management with line or military organization generally leaves the development of methods and processes to the department foreman. Generally he has neither time nor facilities to determine best procedure.

The department foreman, under this type of management must be a man experienced in all of the functions coming under him. These are usually many; he can perform each one only partly satisfactorily. When men were sought for these positions emphasis was placed upon experience. The men concluded that their experience was their value. They did not have time nor equipment, and perhaps not the necessary qualifications, to analyze their problems.

Many of these foremen perform satisfactorily; their practical training made them resent delegating any part of their work to others, or receiving instructions from those less qualified by practical experience to direct the work.

Management is concerned with reasons for occurrences. Management with the old type of organization is based upon "rule-of-thumb" knowledge.

Functional management insists that possibilities be determined by reference to a scientific investigation,—that procedure be according to what is found best,—that instruction be offered those interested so that they can perform as desired. Standards, methods, policies, etc., are then controlled. Costs are determined from current operations and can be controlled. Incentives for increased production are offered the workers.

This form of management insists that work be divided into its respective classes and that each class be under the supervision of some experienced sub-executive. These men are responsible for the correctness of their instructions. They are called upon to cooperate with men of equal authority in other departments. Cooperation is thus obtained.

Organization

Business organizations were developed under conditions where mili-

tarism was an important part. It is not surprising that what was at hand was accepted and used, for business was then an infant.

This type of organization to a large extent is now obsolete. Management finds itself further and further removed from the operations of the plant. This has made direct control of each function a practical impossibility.

A careful study of the multifarious duties imposed upon a department foreman, showed that it was unreasonable to expect that every foreman could satisfactorily perform all of the duties assigned to him. The functions sometimes call for supervision of operations in various parts of a plant. Functionalization remedied this.

General

Business is rapidly becoming a science. Organizations are being developed so that facts can be determined. The goals for eventual attainment are placed before the personnel. By careful analysis the best methods are being determined and operations standardized. Men possessing the inherent qualifications for a job are secured and they are taught to proceed as desired. Cooperation is based upon a desire to aid. All situations are controlled by standards in both the factory and the office.

THE CHAIRMAN: I see Mr. Wallace has come in since Mr. Jones commenced to talk. Would you like to speak to us on Standardization, Mr. Wallace?

MR. L. W. WALLACE: I don't know that I can add very much to this discussion in view of what I said yesterday with reference to Standardization. However, I feel so keenly about the importance of the entire subject of Standardization that I cannot resist the opportunity of saying another word or two about it.

As you know, I have been actively engaged for three or four months in the study of the elimination of waste in industry. As I was talking to Mr. Emerson a few minutes ago, after three or four months of application to this subject, there stands out in my mind two important words, both of which I referred to yesterday afternoon—they are "Standardization" and "Stabilization." Indeed, before we got into the work very far those two topics appeared large on the horizon. You must standardize and stabilize your industry. If you will standardize the activities of industry you will eliminate a great many of the troubles that are appearing in industry everywhere. If you then add to your Standardization, Stabilization of the character referred to in my address of yesterday afternoon, you will remove many others. Standardization plus Stabilization will equal increased production at lower costs.

It is amazing how little attention we pay to this matter of standardization. Do you realize that nearly all the elevators used in our office buildings and hotels in this country are to a large degree built to order? In the city of New York the elevators in the office buildings handle more passengers per day than all the transportation facilities of that great city put together. Yet there isn't an architect or engineer that has set about to Standardize his methods and build his building around a main artery, namely the transportation system of that building. As a result, after he has designed his building, he finds a niche somewhere in which to put an elevator. It has gone so far that in two or three instances in the city of New York in prominent and high grade office buildings there was no place in which to put the elevator. Make-shifts had to be made, with the result that passengers who must use that transportation facility daily are inconvenienced. This unplanned for construction was of great expense and represents but another example of the lack of standardization.

How many of your factory executives have a standard "policy book?" How many hours a day do you spend in deciding questions that had been settled six months, yes twelve months ago? During the war I was employed in a concern and in about two weeks I began to realize that much of my nervous energy was expended from day to day in giving decisions on matters that had been passed upon months previously and I had nothing to guide me. For instance, two foremen would be arguing about something that had been settled some time before, or the superintendent and general engineers would ask me to settle something that had been passed upon two months previously.

There had been no standard method of setting down those decisions and writing out those policies and putting them into the hands of the employees so that when the problem arose they could turn to pages so and so and know what the answer was. So we set about to develop a "policy book" and we placed a man and a woman in charge of it. They worked for several months on that one thing of writing the standard policy of that organization. This eliminated a great deal of time of the higher executives heretofore spent in answering questions and settling disputes that were answered weeks and months previously. This condition is multiplied over and over everywhere in every avenue of social activity.

There isn't a more important thing for this Society and for the industrial engineers of this country to set about to do than to bring about the standardization of methods, of procedures, of design and operation in the various phases of industry.

Yesterday I referred to the matter of terminology. During the past two weeks I was engaged in this work with groups of The Taylor Society,

The Mechanical Engineers, The Accounting Organization, Economists, etc. We spent some time in deciding what the policy should be with reference to certain interpretations of words. An organization to a man of The Taylor Society means one thing and to an industrial manager it means another thing.

Go out on the street this afternoon and ask a dozen men what they mean by collective bargaining and you will obtain twelve different answers. A good deal of time was taken up in trying to arrive at some common interpretation of the meaning and application of collective bargaining. We need to standardize our terminology, come to a common understanding, so that we will all be talking a common language and save effort. We haven't scratched the surface of this subject and as indicated by Mr. Gilbreth we are way behind European countries.

There has been a committee on engineering standards in operation for three or four years. They have been spending \$50,000 a year working out common standards—engineering standards. Some people thought we were doing a great work in starting a great thing, but European countries have worked on that for years. In Europe it was financed and encouraged by the government. While we spent \$50,000 a year with no support or encouragement from our government, standardization of like character in European governments was being carried on where they were expending hundreds of thousands of dollars.

Why have the British Government, Holland and Germany been spending hundreds of thousands of dollars a year for standardization of their products and methods? In order to go into foreign fields and be able to compete in business. Our American manufacturers today are up against that one problem of being able to compete in foreign markets with foreign production. That is why our sales managers have got to bring to the attention of management the necessity of eliminating the multitude of designs we have and come down to Standardization. Mr. Emerson says: "If you Standardize your work you perfect your technique." Those two elements bring about a reduction in cost. So I wish to compliment the Chairman of the meeting this afternoon for bringing up for consideration this important subject of Standardization. I hope that out of this there will come something constructive whereby this Society may become active in developing a new thought and effort in this country leading to standardization which will go a long way in eliminating a great deal of the uneconomic conditions now present in the industries. (Applause.)

THE CHAIRMAN: The chair does not wish to indicate to this meeting that he does not recognize the importance of the remarks of Mr. Leffingwell and Mr. Gilbreth. Without attempting to dictate to the meet-

ing it would appear that probably a good way to obtain the sentiment or to start action in reference to this subject might be the appointment of a Committee to draft a resolution to be submitted to the Society. The chair is entirely in sympathy with the thoughts of the two gentlemen and it seems something ought to be done. If there is any motion in the mind of any of you with reference to such a subject, the Chair would be glad to hear it.

MR. J. J. DAVIS (Oshkosh, Wis.): Mr. Gilbreth said he had something further to say. I should like to hear from him.

We have standardized our methods of measurement and management procedure. We have done something in the way of methods of paying wages, not particularly bonus schemes, etc., but the method of arriving at proper relative wages for different jobs. It seems to me there is a lot of work needed along that line.

There are certain elements perhaps that go to make up every job in the amount of fundamental education necessary—I mean, reading, writing, and arithmetic. Take the amount of general experience necessary, the amount of special training at that job, the amount of skill or special talent that may be required and the amount of initiative necessary. I mean initiative whether supplied by an automatic machine or supplied by the operator, the amount of energy required, whether the units to be handled are heavy or light, the amount of monotony or some other term to describe the monotonous, continuous operation, something as to the surroundings, whether pleasant or otherwise—causing excessive fatigue, the amount of risk involved, and perhaps the amount of advancement, and from all of these there might be a relative scale established by which one job can be compared with another and as a result of such analysis we arrive at a fair basis of comparison.

It seems to me that such a standard means of analyzing a job that would be applicable to jobs in wood-working factories or machine shops would eliminate useless competition in industry and sometimes unreasonable variations in the amount of hourly and daily wages paid for comparatively similar operations. It would eliminate the absolute injustice sometimes present of paying a thoroughly skilled and well trained man only a cent or two an hour more than is paid a green man at the same operation. I feel certain there is a large field for investigation on this subject. It has interested me considerably but I have found precious little information on it. If I could get any discussion along those lines I would feel personally grateful.

MR. JOHNSON (Dunlop Company): This is my first meeting and naturally I have been looking around to see whether I shall get anything

out of it. Mr. Gilbreth brought up some very interesting points. I have a lot of questions to ask but like this gentleman over here I don't think anybody is going to solve them for me—I must work them out myself. It seems to me if I have been getting the sentiment of the people here that a motion is in order. I should like to make one to the effect that we decide on the metric system.

MR. GILBRETH: I don't want to be misunderstood. My subject is for everything except the lineal measurement—I don't want to bring that into the discussion.

THE CHAIRMAN: Mr. Johnson has made a motion that this meeting go on record in favor of the metric system as applied to all measurements other than lineal.

MR. GILBRETH: I should like to change that. I would suggest that this meeting take action to go on record in favor of the adoption, (not exclusively,) of the metric system for liquid, dry, mass and weight measures. We can leave out all mention of lineal measurement because if you mention it, it would look as though we were opposed to adopting it.

I started doing standardization work in the year of 1895. In 1897 I had the pleasure of coming over from New York with Mr. William H. McCalvin. We were school-mates and saw each other every day for years and we had not seen each other since we had been at work quite a little while.

He said: "Frank, I understand you are crazy on this standardization subject?"

I threw my chest way out and said: "Yes, Sir."

He said: "Do you have it in writing?"

"Oh, no, we haven't."

"Then you don't know one thing about standardization, you are fooling yourself."

He told me a long story and ended up by saying that if your standards were not in writing you hadn't any.

I went home the next day and started working on those standards and we still have some of those original standards today. We laugh at some of our standards as we look at the old records. This year we believe we shall have more than ten thousand standards which we are willing to back up in our organization. These standards have come from all sources, from our clients, from foreign countries, from everywhere. Anybody who goes into this subject of standardization properly and is not prejudiced, will get good results, but any man passing an opinion blocking standardization is a menace to America.

I know what I am talking about. You cannot put the metric system over in the United States today—you are not strong enough. The only thing to do is to make a compromise. I have in my possession in this city hundreds of standards made by the greatest engineers in Europe. I know that super-standardization, the kind that my friend put into my head, is the biggest thing this country can do and the biggest thing the Society can do and I am ready to go to the mat with anyone who wants to talk 1876 arguments against the metric system.

You might be able to put the metric system over without interfering with the inch. Therefore, I would suggest that this motion be made on the basis that this Society in its program of standardization, so ably led by our leader, our president, who has just stepped out, be in favor of the use of the metric system for liquid, dry, weight and mass measurements and that all standards made in any other measures are also to be given in the official records of the Society in the metric system.

The motion was seconded and carried.

THE CHAIRMAN: Is there any further discussion that you care to take up?

MR. A. B. SEGUR (Chicago): I should like to answer the gentleman's question with reference to wages. If he will look in the Civil Service Report of 1912, he will find the answer to his question.

MR. C. D. ANDERSON (Chicago): We have heard Mr. Gilbreth and these other gentlemen on their methods on standardization. I am with a concern manufacturing parts for different automobile companies. For instance, a shackle bolt for one concern may be at least fifty per cent larger than a shackle bolt used on a car of another concern. If it is possible to standardize those parts it will reduce the cost considerably. Here you have a piston pin for three different cars none of them alike and yet there is only a tenth of an inch difference. If those things can be brought down to the point where they are similar, each of those concerns could save at least ten or fifteen per cent on the cost of that one item.

The spark plug question is another which comes up every day. We have thousands of automobile users. One engine may take a seven-eighths spark plug, another, a short or a long one. There are four different kinds of spark plugs for identically the same size engine.

With reference to the matter of bolts and nuts, they are standardized within their own organization but they are not standardized as a whole. You may have standardized your parts within your own organization but they don't coincide with the parts of another organization.

Somebody remarked that we must go to sleep before we wake up. There are people coming here from Germany and they will tell you that you cannot put a machine on the market over there which doesn't use the standard spark plug of Germany. I believe that is true in France.

We have figures estimated on much of the work done over there and they require you to show them a sample and they will say that is over or under standard. If we are asleep let somebody wake us up. We will not get there by talking about it. We must make our standards come within the S. A. E. classification—that is standard. (Applause)

MR. NATHAN: I wish to reply to the gentleman and say that the Society of Automotive Engineers has in its organization, makers of parts. These standards are adopted as recommended standards of the Society but we cannot force any standards down anybody's throat. It is up to your manufacturers to say that. We must educate the makers to adopt reasonable standards so that the whole process will work advantageously. I want to emphasize this point that the standards are recommended. We haven't prescribed that makers shall use them. You cannot tell a man what he shall and what he shall not use, at least you cannot at present.

MR. LEFFINGWELL: I don't think there is any question that somebody in the organization can figure out the required standards. The trouble does not lie there. Our trouble is that we are not doing anything about getting these standards adopted. We took the first step today in the motion which I seconded of Mr. Gilbreth's about the metric system. Now what I should like to see done, and I shall make the motion to that effect, is that this Society take some steps to sell the idea of standardization. That is all I wish done. We should get the people thinking about standardization.

People are thinking of standardization to a certain extent. It was forced upon them during the war and Mr. Hoover and his committee, of which Mr. Wallace is a member, have done a great deal. But what we want is that these committees who are standardizing, who are getting statistics, arouse the manufacturers to the point where they will put these things into effect and take some interest in the matter. I believe almost every organization here this afternoon agrees with me that something ought to be done and yet nobody suggests anything. We should get advertising men on the job, men who know how to convert the public opinion. My friend, Mr. Thomas, over here of the Factory Magazine would be a valuable man in that respect.

With your permission, Mr. Chairman, I offer the following resolution:

Resolved that it is the sense of this meeting that a committee be appointed by the Board of Directors of this Society to actively plan a comprehensive program of steps toward Standardization; to schedule and execute a publicity campaign for Standardization in Industry, and

Be it further resolved that we hereby pledge our support to a campaign individually and collectively.

Let us form a committee on gathering examples, selling arguments, etc., and after they are ready let us do something. We have been talking about standardization ever since the Society was formed and we are in a way selling the idea. Each of us is trying to sell it in our own particular way in our work but I want the Society to get the people to think of this question to sell the idea, not to just get everybody to agree with us.

The motion was seconded and carried.

ADJOURNMENT

THURSDAY AFTERNOON SESSION

April 28, 1921

Accounting Group

"COST ACCOUNTING AS AN AID TO EXECUTIVE CONTROL"

Chairman: CLINTON H. SCOVELL

Scovell, Wellington & Company, Boston

THE CHAIRMAN: About a week ago I had a letter from the Milwaukee Chamber of Commerce asking for a copy of the speech I was going to make this afternoon. In reply I wrote that I was not going to make any speech, that I thought my responsibility was to steer the discussion, and that I would not consider this meeting a success unless I got considerable discussion.

I am very happy to say that Mr. Haynes, Mr. Goodwin and Mr. Barr are here to lead off the discussion, but I am sure they will share with me in wanting other people to participate.

The dinner at the Hotel Plankinton last night, which some of you attended, was called to discuss production, but it had no more than gotten under way when the men found themselves discussing cost accounting. This was rather significant from my point of view, for the cost accounting matters they talked about were the very subjects in which, it seemed to me, an executive ought to be interested. Once in a while you will find an executive who is really anxious to ask, "How near is this job done?", and "How much has been spent on this job to date?", but the executive board generally wants to know about trends and developments. From the point of view of an executive I think the controlling aspects of cost accounting are far more important than the details. The details are important, and somebody has to concern himself with them, but rarely will it be the chief executive.

Since the whole program of this Milwaukee meeting is devoted to the idea of educating the industrial community to the significance of such services as all of us are rendering to executives, I think that the most useful thing I can do is to steer the discussion toward some of the subjects which occur to me as possibly significant and to invite you to bring up topics which you think are significant.

One broad question that I should ask immediately is this: how good is a cost system that is not tied in with the bookkeeping. Rarely do you find a good cost system that is not so tied in. If anybody desires to uphold

the other side of this proposition, I wish he would make a note of it and pitch in just as soon as we call for discussion.

Another significant subject is the proper method of accounting for losses or gains from material fluctuations. To give you something to talk about, I propose that such losses or gains be as generally as possible separated from the losses or gains which result from manufacturing and getting a gross profit between price and factory cost. Consideration of this theme, of course, should take into account the nature of the manufacturing. If the plant is making a standard line of its own, as most plants are—baby carriages, ice chests, automobiles, machine tools or anything else—you have one group of factors to consider. If, on the other hand, the plant is manufacturing exclusively to customers' orders, as would be true in a drop forge or pressed metal plant, you have another set of factors to consider.

I am not quite sure what the best practice is for the standard manufacturing plant, but I am very positive that in the jobbing business I would charge material to the cost of the order at the price at which I had estimated that order. Such a price might be the current market rate; it might be the price at which I had acquired the material, or it might be quite a ways off from either one according to how much I wanted the order and how keen I was to cash in on the inventory. I would, of course, relieve the inventory of the value at which the material stood in it, and would carry the difference to Loss and Gain on Materials.

I would follow the same procedure in a non-jobbing business like shoe manufacturing, in which it is characteristic that lines are sold months before they are made. Shoe manufacturers will very shortly be making up their samples for the spring of 1922; they will be taking them out in the late summer and fall of this year, and securing orders for deliveries next March and April. They are reckoning so much a foot for the upper leather and so much a pound for the sole leather or so much a pair for the cut soles; yet next February, when they buy to take care of their production, they will get the various elements at prices more or less than they have figured. They are, therefore, going to have material losses or gains which will be quite distinct from the losses or gains that will come from making shoes and selling them. This is the sort of matter which interests executives a great deal.

Another subject which at this time is interesting to executives is the relation between overhead and volume of business. Those of you who have read my book know that in it I modestly claimed to have first put into practice the idea of a standard burden rate which, if the products were

normal in amount, would absorb all the burden; but which, if production was subnormal, would leave unearned burden to be charged not to cost but to profit and loss. I have been interested to observe that the idea has been so popular that several other people have claimed to have originated it. So far I have been cheered with the thought that nobody has taken issue with it, and some have given it courageous support. It is comparatively little understood, however, and we might discuss how well an executive can manage his business and interpret the significance of volume if he does not account for unearned burden.

Another thing that interests executives a good deal is accounting for spoiled work. We might discuss some of the types of spoiled work—spoilage as the result of defective material, spoilage as the result of inappropriate material (not the right kind for the job), etc. Then we might consider the kinds of spoilage which are inevitable, like breakage from occasional slips and jams in the manufacture of certain kinds of glass articles. The only question is as to how small a figure you can restrict it. If you are putting 15,000 pieces a day into a press, it is not human not to spoil some of them; perhaps if you are putting in only 1500, it is not human not to spoil some. Then there are the spoilages which result from outright poor workmanship.

In all cases of spoilage a very interesting cost principle has to be considered. If you start 1,000 pieces and finish 800, shall the 800 carry all the cost of the thousand, less the salvage of the 200 bad ones? If so, to what circumstances will this principle apply? Are there any exceptions? When will you try to distinguish between spoilage which is inevitable and characteristic, and spoilage which is accidental and not to be expected. What can you do to reduce spoilage to its lowest factors?

Having thrown those four subjects into the ring, I shall revert to the referee's position and see what ideas the group can develop. Just to summarize—the first question relates to the significance, if any, of a cost system that is not tied in. The second broad topic is accounting for material losses and gains. The third is the relationship between overhead and production, or the handling of normal burden and unearned burden. The fourth subject is spoilage.

The program says that Mr. Haynes will start the discussion. Which one of these topics or what other ideas would you like to discuss?

MR. HASBROUCK HAYNES (Haynes Corporation, Chicago): My remarks will be confined to the tying of the cost system into the accounting records and the advantages to executive control in doing so.

In order to get a good picture of the situation, let us imagine for a moment that we are owners of an industrial concern—a manufacturing

plant. (Possibly at this time some of us are better off than we are not owners of such a plant.) You will all agree that very frequently we will want to know the exact financial condition of the business, no matter whether the concern is prosperous or not prosperous, whether we are actively engaged in the business or are absentee owners.

Two statements reflect the financial position of the business about as completely as do any that I know of. One is the balance sheet, which shows what the business owns, what it owes, and what its net worth is; the other is the profit and loss statement, which accounts for the difference in net worth between one time and another time.

Practically all manufacturing concerns draw off a trial balance every month, but I am fairly safe in saying that only about five per cent in this country have a monthly balance sheet or a monthly profit and loss statement. Of course, those of you who are accountants know that it is not necessary actually to close the books in order to draw off such monthly statements.

What is the difference between the trial balance on the one hand and the balance sheet and the profit and loss statement on the other? In order for a manufacturer to get a balance sheet or profit and loss statement every month, he must have a perpetual inventory. Where the trial balance alone is drawn off, it is usually because he lacks such an inventory. By perpetual inventory I mean the money value of the inventory rather than the number of particular articles or items that are carried in stock. In order to have this value to complete the list of assets in the balance sheet, a cost system is necessary.

Aside from the essentiality of the perpetual inventory for the monthly balance sheet, it is particularly desirable for a manufacturer to know the value of his inventory every month. There is a normal amount of money which a man can carry in his inventory and above which it is a dangerous policy for him to go. I know right now of a manufacturing concern that has an inventory of about \$200,000, and it does an annual business of only \$300,000. In that particular line there is no demand for so large an inventory; it is the result of war conditions, of the purchase of material in order to have it on hand, and of the delay in production caused by moving into a new building. When too much money is tied up in an inventory, as in this case, then the money is not available for other purposes, and the company will not be able to make the needed profit on its investment.

Some of you may be interested in this chart showing the monthly profit and loss statement with the balance sheet. The first two rectangles represent the balance sheet at the first of the year or, we will say, at the first of the month. We have current assets, inventory assets and invest-

ments. (I presume the accountant will immediately catch me up and say that the inventory is a current asset. From the banker's point of view that is true, but on this chart I have shown the inventory separate.) Then we have the liabilities, consisting of current liabilities, reserves, capital stock and surplus. You will notice that the two balance each other.

The next rectangle represents the sales for the month. The horizontal distance might represent the scale. To get the monthly report we must deduct the cost of the goods sold, and then the commercial expenses, such as administrative and selling expense. The last square represents the net profit. This profit comes over into the balance sheet at the end of the month and is added to the surplus in order to complete the balance sheet, and there are changes in the other rectangles of the balance sheet owing to the alterations that have taken place.

The second chart shows somewhat the principle of the perpetual inventory. To the inventory at the beginning of the month, made up of raw material work in process, finished product and supplies, we add the purchases of material, labor, expense and supplies. You will notice that the factory expenses are added as well as the material and the labor. Then we deduct the cost of the finished product sold, and the balance represents the closing inventory. In order to get the cost of the goods sold, it is necessary, of course, to have a cost system.

The principal thought that I wish to convey is the desirability of tying the cost system up with the accounting records. The financial control of the business through the balance sheet and the monthly profit and loss statement is the most valuable means that the executive has for the direction of the business. The monthly profit and loss statement, of course, can be divided up into the different lines of product, so that the profits are known not alone on the business as a whole but on each different line of product. The cost system goes even further than that; not only does it show how much money has been made as a whole and how much has been made or lost in each line, but it shows also the percentage of the profit in each line. With a cost system tied into the accounting system, the executive can trace back any particular line that is not paying its normal percentage of profit, and judge the advisability of discontinuing that line, increasing the sales price or producing a greater volume. He can examine the cost figures to find the material, the labor and the factory overhead costs of that particular line, and by analyzing these figures determine the possibility of reducing some elements of cost.

THE CHAIRMAN: The next speaker is Mr. L. R. Goodwin.

MR. L. R. GOODWIN (Arison, Goodwin and Associates, Chicago):

My experience in the professional field has proved to me that a great many executives have not yet appreciated the facts of their business. The question I want to bring up for discussion is why they have not been made to do so.

My work, particularly for the last nine months, has been confined to association cost accounting. The first objections brought up when you approach a man in regard to the installation of a cost system are that it is too complicated and that it costs too much money to keep up. These are two fundamental reasons against cost accounting. Those of us in professional work must, by simplifying the results or the statements so that a lot of manufacturing executives can understand them, bring home the necessity for cost information. A great many executives, my experience has shown, feel that a statement is a lot of red tape or a lot of technical information that they cannot understand. That may seem strange to us; yet is absolutely true.

A great many of these men have been in their particular lines for many years and are in close touch with what is going on. The majority of men who depend on visual information, however, do not have a real conception of what is taking place. As a concrete example, a manufacturer in the west was producing certain articles in the confectionery business and flooding the trade at a price about twenty or twenty-five per cent under the normal market. He asserted that he had figured his costs, but he was finally persuaded by other members of his association to put in a real cost system. The results showed that his prices were from fifteen to twenty per cent under the actual cost of production. The result had been a demoralization in the trade, because as one of the larger manufacturers, he was looked up to as having a cost system, and when he set a price the others followed.

It is dangerous, more so now than a few years ago, to depend upon visual information or unproved information, because of the effect not only on your own business but also on the other people and trade in particular. Did all of you read the article by Mr. Hurley in the April "American Magazine"? He said that a great many people would be better off matching pennies than doing business as at present. In his opinion, operating a business with out an adequate cost system is worse than matching pennies, because in matching pennies one has at least a chance whereas without a cost system one has no chance at all.

THE CHAIRMAN: The third gentleman appointed to lead in this discussion is Mr. Earle G. Barr.

MR. EARLE G. BARR (Chicago): One reason why so many managers object to a cost system is that they do not know how to use one.

They do not realize that a cost system is more than just a means of figuring cost and thereby determining the selling price.

Our topic is "Cost Accounting as an Aid to Executive Control". The difference between cost accounting and old-time accounting is that old-time accounting merely recorded account-abilities and responsibilities for values, whereas, in addition to that the modern cost system must record accountabilities and responsibilities for **results**. In order that the modern cost system may do that, it is necessary that it be laid out in parallel with the organization. The cost system, in other words, should be like a glove fitting the departmental fingers of the two fists of authority, so that as the finger representing a department moves, so will the corresponding part of the glove. By means of the glove the executive at all time has control over the activities of each department, for he is holding some human being responsible for each finger.

Control from the point of view of the executive does not come from knowing what an article ultimately costs, but from knowing what items of cost are not normal.

I am going to speak just for a moment about the psychological effect of a cost system. Suppose that one of you is a foreman and I am the big boss, and that I call you into the office and, handing you a list of the expenses of your department, I say, "What is wrong with your department? See how the expenses this month have gone up without an increase in production; your volume of product does not warrant such an increase in expenses". "Why," you say, "I am not responsible for the increased cost of steam which we use in our department; that responsibility is over in the power plant. I am not responsible for taxes; I don't control those either." In short, in order to have true psychological control, I ought to have cited from the departmental expenses only the ones under the control of the foreman.

Here is a chart which goes to the department manager; it has on it only those expenses which are under the control of that manager—salaries, non-productive labor, overtime allowances which his department used, advertising for help, factory supplies, small-tool expense, replacements, office-supply expense, printing and stationery, and current expense unclassified. These constitute merely part of the cost of the product as it goes through that department; they include only those expenses for which the department manager can legitimately be held responsible. Outside of this group of controllable items are two other groups: predetermined items, such as insurance, taxes, depreciation and so forth; and apportioned items, such as boiler plant expense, gas expense, water expense and those other expenses a part of which are charged to the department. Psycho-

logical control can easily be destroyed by holding the manager responsible for groups over which he has no authority.

THE CHAIRMAN: As moderator I want to pick up a thread which has been left dangling a little bit between my own remarks and the contributions of the other three gentlemen. I refer to the fact that the significance of overhead or burden is very much greater in some kinds of business than it is in others, and that its significance varies not only with regard to the ratio of direct outlay for material and direct labor in comparison with the indirect labor and overhead, but also in respect to the time factor. You cannot show much reason for a very elaborate cost system in an industry that is making whisk brooms, when you clean up every scrap of work in process in one day. Other kinds of manufacturing too, have a very short cycle. Candy has a very short cycle. Suit cases and hand leather goods have a cycle not quite so short but still not very long. The significance of a cost system in such industries is altogether different from that in a plant making printing presses or machine tools, or in fact any articles that have a long cycle. Where burden is significant, it is very significant.

Mr. Barr's comment about picking out the things that ought to be reported to a department head has a positive as well as a negative side, as he suggested. Not only should you not torment a man with something for which he cannot recognize his responsibility, but you should give to him the things for which you do hold him responsible. With this comment we shall call for discussions from the floor.

MR. A. J. REDEMSKI (Chicago): The point which Mr. Scovell brought up, in regard to keeping the profits from material fluctuations separate from the profits derived from manufacturing, is one that interests me a great deal. I run across it very frequently, principally in the packing box and container industry, where lumber and container board are used. In the wooden-box factory material is usually bought a long time in advance of the consumption, and in the meantime the market fluctuates. Boxes have to be sold on the current value of material, because no two manufacturers will have the same value or the same period of stock accumulation and I have heard very frequently that materials should enter directly in the product at cost. I believe, as Mr. Scovell does, that the resulting profit or losses ought to be set up in an intermediate account, so that they can be recognized. During the last year, when lumber prices went up more than they usually do, factories made what appeared to them to be a very handsome profit; yet many of the manufacturing operations were conducted at a loss, and only a part of the increased value of lumber was realized at a profit.

In container board and container plants the problem is a little different. In that industry there is a tendency for box manufacturers to acquire and operate their own mills, and it would not be fair, of course, to go to the extra expenditure of building a mill, operating it and tying up capital in boxes, paper and other ingredients, and then carry merely the cost into the container product. It seems to me that materials for the box factory should be priced at the market value at the time of their production, not necessarily the top market price, but something that approximates the market condition at the time. From there follows the same procedure as suggested for lumber where market fluctuations are particularly great during the period.

The question of overhead is also a very important one in the packing box and container industry. In times like these, when most of the plants are operating on about a forty per cent basis and are not especially reducing their overhead because they are scrambling for business and taxing their sales forces to the utmost, they have certain charges that are going on all the time. To allocate these overhead charges on the reduced volume of output would certainly operate to prevent the plants from getting into the market or encouraging customers to buy and bring back normal conditions. In the cases where I have helped to handle overhead in its relation to volume of business, we have used a normal period of a year in determining the amount of overhead and have let part of it go for the present as an associated item to be taken up later when business improves.

As to tying up the cost system with the general accounting, I believe that progress in cost accounting has been slower than it should have been because too frequently the effort has been made to get all the refinements of cost accounting in from the start. In a wooden box plant I had started to lay out a plan for securing the general classifications of cost which were made up through real differences in the product. When I turned the work over to an assistant, he said that the system was not the right kind—that we should have job costs. I said: “You boys are working in an industry in which the principal material is lumber. Lumber is a product of a tree, and a tree grows by first developing a sturdy trunk, something that can carry the properties and saps from which the later development comes. Then in turn follow branches and foliage and flowers and fruit, all in their natural order. That, I believe, is what you can do in your cost work. Get your main structure firm and solid, and then let it branch out. If you hang a flower in the air and expect the trunk to grow to it, the flower is certain to wilt.

THE CHAIRMAN: That sounds like an experienced testimonial. Lets have a dozen more.

MR. E. B. GRAUPNER (Chicago): How can you keep track of salvage? Suppose, for example, that out of a lot of 1,000, 750 parts pass inspection, and 250 probably have to be reprocessed?

THE CHAIRMAN: We are all agreed that some one is going to make a decision whether the material shall be thrown away or shall be done over and salvaged. If you throw it away you have your throw-away record to make, and then you have the accounting to apply to the lot in which it is started. That leaves unanswered the question as to whether that damage was accidental or typical. If you get a dimension wrong, that strikes me as accidental. The assumption is that the dimensions will be made correctly; and if somebody gets the dimensions wrong, he has blundered some way.

To get back to your salvage problem, if you are going to do some parts over, why is it not necessary to make the same kind of a cost order to refinish the job as you made when you started in the first place?

MR. GRAUPNER: I want to know just how you can tie those 250 up with the cost of that particular order and get away with it economically. I want to dispose of it at the expenditure cost.

MR. HAYNES: Could you not just credit the order on which the thousand were made up with the estimated cost of the 250, and charge this to a salvage account?

THE CHAIRMAN: You clear the order of a quarter part of its cost accumulated to the point where the rejection occurs. That leaves the original order carrying 750 pieces with the cost that belonged to 750 pieces, and they go on to the finish. Then you take the 250 rejected and issue another order on them.

MR. GOODWIN: Would it not be possible in a case of a general process to set aside the 250 in the salvage account and wait until more rejected material could be added to make up a real order? Thus you might have a second lot of 1000 coming through short 100. You would then have an accumulation of costs on three different lots—two complete lots, one of 750 and another of 900; and a lot of scraps, without the material cost. The three brought together would give a running cost extended over a long enough period to get a normal production.

MR. GRAUPNER: On the assumption that we can get out cost on the 750 and the 900 of the two lots mentioned, it is the 250 and the 100 we are particularly interested in. What we are all talking about is the cost of an individual product for comparative purposes. If we fooled ourselves that the salvage could be dumped into one pot, how would we finally determine the cost of a particular salvage? There would be no way to identify in on the ledger. In other words, we could identify a given

part known as No. 1, but when specimens of this part from various lots had to be reprocessed, errors might have occurred at different points. As I see it, with a general salvage account, we could not do more than include salvage as part of the burden rate.

THE CHAIRMAN: Would you collect your salvage as an accumulating expense and then transfer that as you would some other expense account?

MR. GRAUPNER: Yes.

THE CHAIRMAN: On what basis would you distribute it? Suppose that you have a plant that is making small machines, with six or seven hundred different pieces in the machine, and that you have more or less of this spoilage which is either discarded or done over. You must define very clearly what is to be charged to the salvage account, but having gotten an accumulated expense in this account, you face the problem, if I understand you, of charging it back through the burden accounts. On what basis would you undertake this redistribution of the salvage? It is a perfectly possible thing to do, but how?

MR. GRAUPNER: The accumulated salvage could be distributed on a dollar and cents basis according to the relationship of the various burden accounts, the relationship they bear to the various departments, or the various rates, whether departmental rates, machine hour rates, or any other rates.

MR. BARR: Have you in mind a standard part which is going to be run in a number of lots along through the years?

MR. GRAUPNER: It could be a standard part or work in a contract shop.

MR. BARR: They present two entirely different problems. If it is a standard proposition with a number of lots, you are going to find many different phases. The size of the lot, for instance, has a great deal to do with spoilage, for this is more likely to occur in the first part of the run. The size of the run, therefore, affects the rate of spoilage.

Another phase concerns who is at fault for the spoilage. When the size of the lots is standard, you can, even if the spoilage is occurring at different stages along the line, ultimately determine what it costs in spoilage for a certain number of parts.

My answer to Mr. Scovell's question is that it might be possible in certain instances to find out what is the reclamation cost of the spoilage accompanying an attempt to produce a certain volume, and then spread this as a supplemental cost over the cost of the parts produced.

MR. HAYNES: We now have the 250 pieces in the salvage account on the basis of the estimated cost of the material and the labor and the

overhead that have been put on the article up to the point where it went into salvage. The next step is to issue a repair order if the parts can be salvaged rather than completely discarded, and then to charge the cost of that repair order to whatever department was at fault for spoiling the part. That department would automatically bear the amount in the spoilage and loss account of its overhead.

MR. GRAUPNER: Mr. Haynes' method is one that I have tried without success. If we had a hundred per cent inspection, it would solve the problem and lay the blame on the department where it justly belongs, but we all know that a lot of defective parts get into other departments, and we can never tell just which department is to blame. The only solution of the problem, I believe, is to spread the salvage over the entire product along the same lines that the application of burden follows.

MR. GOODWIN: One of the first principles of cost is to get the distribution as close to the immediate source as possible. Suppose the article that we are considering is a cross part of an automobile frame. If it is rejected because it is cut too short, obviously it is beyond repair for that particular work and must be scrapped. If the punching is the reason for rejection, the part can probably be repaired.

Suppose that out of a dozen orders we determine the average cost of production (the orders might be for different sizes as far as that goes), and that during the period we get a repair order, say, three times which will show the cost of repair of parts without any material. Then the final result; or the cost of the cross member of the frame, is the average cost of twelve orders plus the repair cost on the three repair orders. Those repair orders have to carry their proportion of the labor and burden, but they do not have any material cost charged against them.

THE CHAIRMAN: In other words, as this part is made in a succession of orders, some spoilage will occur, and as your record lengthens, you get a truer average as to spoilage and secure a constantly increasing average cost. That is one way to dispose of it.

MR. GRAUPNER: Mr. Goodwin's answer has given me some light on the subject and so has Mr. Haynes', but I should like very much to see what would be set up on the cost ledger according to Mr. Goodwin's method.

THE CHAIRMAN: You would have to issue a repair order which would have the same start, as I take it, as any other order. It would be different from the original orders in that it would not include the material, or the operations which had been completed before the damage occurred.

MR. GOODWIN: In a factory making automobile parts, where I had experience, that is the way it was handled.

THE CHAIRMAN: We should not lose sight of the fact that no matter what we do, it is of very large importance for executive control to have reports which show what did happen and what has to be done over or thrown away.

Does anybody want to suggest circumstances under which a cost system that is not tied in is worth having?

MR. LEE HALL (Chicago): In some circumstances estimated cost systems might be well applied. There are many factories employing 200 men or less. In these factories I think in many cases it is a good plan to standardize the work and so arrange it that production is made better and the cost thereby is more easily obtained, before an elaborate cost system is installed.

THE CHAIRMAN: Would that be your idea of the trunk before the flower that Mr. Redemski told about?

MR. GOODWIN: A pertinent case is that of two brothers in Cleveland. The question of cost work came up and the one that was sold said, "We will put it in complete." The other brother said, "Not on your life! We won't have it." The second brother finally agreed, however, to a cost system not tied in with the books. We put in the cost work and got it in successful operation, and then we had the trunk built. It was a question of only a few months (not three months after the work was under way) when the second brother withdrew his objections and the complete system went in. Thus the branches and flowers came soon. It was a simple case of the necessity of selling the idea to the people and eliminating their fear of excessive, as they call it, red tape.

One of the great values of cost work for associations is the fact that pressure is brought to bear upon backward members to get them to put in the preliminary or initial part of the cost system. In this way a tree is started which will grow and blossom in the end as the association desires.

THE CHAIRMAN: You are proposing simply a compromise. Will anyone else defend that proposition?

MR. HAYNES: I want to make rather a bold statement and see whether I can get away with it. I would rather have a monthly profit and loss statement tied into the books, even if I had estimated cost, than I would a statement of actual cost not tied into the books.

THE CHAIRMAN: I do not think you mean that such a statement could be made to apply universally, but it is broadly true.

MR. HENRY J. JUNG (Hardwood Products Co., Neenah, Wis.): I believe that the extra amount of work involved in a cost accounting system tied to the books is worth the effort. You have a running inventory, and you can determine what your insurance should be on the stock carried.

THE CHAIRMAN: To take up another topic, does anybody want to contest my statement that if you are doing a jobbing business you should charge your material to a job at the estimated figure? That perhaps is a new thought to some of you. Do you want to challenge it?

MR. BARR: Who watches the stock or predicts what the market is going to be? Is the purchasing agent held responsible?

THE CHAIRMAN: That would depend on the organization and on the size of the order. If it was an order which required tons of steel, I suppose the purchasing agent would be consulted, but if it was for twenty cuspidors like these on the floor, I should think that any estimating clerk might get it out. Your point is, of course, that somebody has got to be responsible for the material price. My proposition is purely an accounting one—that the responsibility having been taken by somebody, the figure which he uses shall be the one for charging the material to the order. His estimate for material actually on hand or to be bought for the order may show a profit or loss as compared to cost.

MR. BARR: I worked out a plan in Cleveland absolutely along that line. Considerable statistics were presented to the parties who were responsible for the predictions, and they were held responsible for results.

THE CHAIRMAN: I think that the man who is estimating on an order of from three to twenty thousand should be willing to be responsible.

MR. HAYNES: The plan suggested would be applicable in jobbing plants which are estimating in advance on different work, but in the general line of manufacture I believe I should prefer to have the actual cost.

THE CHAIRMAN: The particular plan I suggested was only for the jobbing business. For a standard business using a material to make its own line, I would modify my proposal somewhat. I would then suggest that the material be charged in the product not necessarily at what it cost, but at some fair "going figure," which might be the current market price or might be identical with what would be used in estimating a job.

According to Mr. Redemski, material between departments ought to move at a fair price. A department using material produced in a prior department, like castings coming from the foundry to the machine shop, should get the material at the price at what it could buy outside. Thus the foundry would make its profit, and the machine shop would make its profit on the fair price of material. In somewhat the same way I would take material out of inventory into work-in-process at a fair price, and let the difference stand as material loss and gain. I admit that this requires a great deal of judgment. If the market is steady over a long time, I would not follow such a practice, but in a market that has been going up and down as in the last two or three years, I would most decidedly account

for material losses and gains. I would withdraw the raw material from inventory at whatever figure it stood there; I would charge the material issued to work-in-process at the determined figure, and I would immediately carry the difference to an account called material loss and gain.

MR. A. J. LUTTERBACH (Milwaukee): Just what would you desire to attain by that?

THE CHAIRMAN: I would account for the profit or loss which the management makes by reason of its policy in respect to materials, wise buying or foolish buying, heavy buying or scanty buying, and keep such profit or loss separate from the profits or losses made from such manufacturing and selling.

MR. LUTTERBACH: Could not the same result be obtained much more simply by carrying, as we and many other people do, an account called profit or loss on purchases?

THE CHAIRMAN: What is the difference? Tell us how you work your account, profit and loss on purchases.

MR. LUTTERBACH: When our sales department sells at the market, we book the orders. When we take the work out of process, we carry the finished goods in at cost. When we take them out and carry them to cost of sales, we meet the adjustment on the price.

THE CHAIRMAN: You are connected with the Palmolive Company, and you are talking about soaps. Do you refer to purchases of oils which are resold in the form in which you acquire them, or do you refer only to sales of goods which you have processed to some extent?

MR. LUTTERBACH: Goods in process.

THE CHAIRMAN: Your statement might be paraphrased to the effect that you have made a stock of finished goods, wisely and carefully manufactured, expecting them to sell them at a profit; then you have to revise the inventory in anticipation of a sale.

MR. LUTTERBACH: What are you trying to get at in your system?

THE CHAIRMAN: I am talking about the use of raw materials that are going into the work-in-process, and you appear to be talking about the fluctuation and value of an inventory of finished goods.

If, for example, I had crude oil on hand, at 60c a gallon and the price was 50c at the time I was to use it, my suggestion would be to charge work-in-process at 50c a gallon and carry 10c a gallon to an account which would be known as material loss and gain. Your proposition, as I understand it, is to take your oil at either 50c or 60c, no issue raised at that point, carry it through into the finished product, and then revise the inventory of finished goods because the market for such goods has dropped.

MR. LUTTERBACH: What is the object of doing what you suggest?

THE CHAIRMAN: I am trying to separate the losses and gains caused by the fluctuations in raw material, from the losses and gains made in production and selling.

MR. LUTTERBACH: Do I not do the same thing? I adjust my prices when I transfer from the finished goods to the cost of sales, and the operating statement then shows the same result as yours does.

THE CHAIRMAN: The net profits would at a later date show the same result, but the difference between your suggestion and mine is that if you have a two-weeks cycle of manufacture and a three-months storage period, I take the loss three months and two weeks sooner than you do. That is one important difference.

MR. HAYNES: It seems to me that if the profit and loss in material can be taken at the time of the sale, it is much more desirable than to take it at the time the material is drawn out of stock.

THE CHAIRMAN: What do some of you other keen listeners think about this proposal?

MR. JUNG: I think Mr. Scovell is right. You make a sale when you take an order. The minute you take an order, you begin drawing on your raw material.

MR. LUTTERBACH: You are working under the supposition of things made to order. This is manufacture from stock.

MR. JUNG: Mr. Scovell's idea in the first place, I believe, was for the job shopper.

THE CHAIRMAN: I will take the jobber's case in the most difficult form in which you could put it. You may imagine the most adverse conditions, and I will still defend my proposition: that if there is an important difference between the current price of raw material and the price at which the concern acquired it and at which it is now carrying it in stock, the adjustment is to be made when the raw material passes in to the work-in-process. If the price fluctuations were small and the price had been very steady over a long period of time, I would not bother; but if the difference amounted to ten cents in sixty, I certainly would take account of it at the time material moved.

MR. S. F. MITZNER (Chicago): How would you work it if the tank car builder had a lot of steel sheets from the Emergency Fleet Corporation at a ridiculously low price?

THE CHAIRMAN: I do not know why the proposition would not work both ways. Suppose you acquire a stock of sheets at a very favorable price; are you not going to get all the profit from your shrewd buying

that your sales judgment will permit? Of course you are. But that is not a profit in manufacturing; it is a profit on buying of material. If your competitors must go out and buy to make an order at that time, they have got to pay, say, \$10 a ton more than you have for the same plates. Reckon \$10 a ton profit on material before you start in; that is all right.

MR. BULLIS: I want to discuss this same problem in connection with the flour and milling business. When a miller takes an order, say for 1,000 barrels of flour, he at once purchases forty-five hundred bushels of wheat to cover the sales. Now assume that the order of flour is not to be manufactured and shipped for three months. Would you enter the wheat at its cost price to the miller or at its actual market value at the time the flour was made?

THE CHAIRMAN: Spot or future wheat?

MR. BULLIS: We will say cash wheat.

THE CHAIRMAN: Is it a fact that if the miller takes an order in April to be made in August, he can buy spot in August to make the order? Does he know that at any time he can buy spot wheat in such quantities? It is always available?

MR. BULLIS: Yes.

THE CHAIRMAN: I am sure that the miller is going to do one of two things. If he makes an August price, he makes it either on his forecast of what the August spot wheat will be, or else on the cost of April spot wheat plus the carrying charges for three months.

I should suppose that the milling business generally would be like the cotton business. The people making the cotton yarns and so forth gamble in the cotton market, or else they buy futures in cotton to take care of their manufacturing conditions. If they buy for future delivery, they have taken the gamble out of their transaction.

MR. BULLIS: Well, assume that our flour miller is dealing in futures.

THE CHAIRMAN: If he buys his future after he has sold his thousand barrels of flour, I do not see that he will have any material loss or gain to reckon with at all. If he puts off his purchase until August and then has to buy, he pays more or less for wheat than he estimated when he took the order, and he has a material loss or gain.

MR. LUTTERBACH: We have somewhat a similar situation, in fact still more complicated. We buy a contract for oil from three to four months in advance, and we sell the refined oil on the basis of present crude oil markets. We also take future orders based on today's crude oil market. We will say for argument's sake that the crude oil is now priced at 7c and refined oil is sold at 11.5c. In the future crude oil may run up to

10c or down to 5c. We must keep the refinery going, and we make for stock. But why should the sales department burden the operating statement with the oil at actual cost when that cost is a factor that cannot be controlled? In other words, the profit and loss statement would at one time show an enormous profit due to rising prices of materials and another time an enormous loss due to a falling market. I would charge the finished goods to cost of sales at the market—that is, on the basis on which they were sold. The difference between actual cost and market would represent our gambling losses or profits.

THE CHAIRMAN: Allowing the sales department a conventional 5% or 10% profit? You are ready to sell on this 28th day of April a certain volume of finished oil. Your records show that this volume of finished oil took up crude at certain prices, but the crude today has a different price. You, therefore, take the difference between the actual cost of crude and its market price today as an **adjustment**, and the difference between the crude today and the finished price as a **sales profit**. Is that right?

MR. LUTTERBACH: Yes. In other words, we are eliminating from the manufacturing profit the speculative profit or loss.

THE CHAIRMAN: Your plan has this advantage. If the adjustment were made when the raw material went into the working process, it is possible that before the goods were sold a further adjustment of the type you are discussing, would be needed. If you started out to do what you do at the sales point, you might have to do that even if you did what I propose at the manufacturing point.

MR. LUTTERBACH: What I cannot see is how we can possibly make use of your method.

THE CHAIRMAN: I do not know that I would advise you to. Your method is a new wrinkle and well worth hearing.

MR. HAYNES: How about the manufacturers who are now using a normal overhead rate rather than the actual overhead and setting up the difference in a profit and loss account?

THE CHAIRMAN: That is a proposal that comes out in the pamphlet of the Fabricated Production Section of the Chamber of Commerce of the United States, isn't it?

MR. HAYNES: The point I want to bring out is this: Do you consider it legitimate, from an accounting point of view, to carry the difference as a deferred charge and wipe it out later when the business picks up?

MR. LUTTERBACH: I do not see why it should be wiped out. It is charged to profit and loss and should stay there.

MR. HAYNES: My thought was that this is set up before it gets into profit or loss.

MR. LUTTERBACH: I do not see how it can be set up as a deferred charge.

THE CHAIRMAN: Nor do I.

MR. HAYNES: It is a matter of policy as to how you handle it. You can charge it off every month against the profit and loss of that month, or you can carry it as a debit reserve.

MR. LUTTERBACH: To my mind the first method is the only one you can use.

MR. HAYNES: Take another case that is a little different from this one. In normal times any manufacturing concern has a fluctuating overhead. We have been establishing a practice in connection with the cost systems that we have installed, of using what we called a reserve for overhead account. We use an overhead that is a little higher than the actual overhead, so that this reserve appears on the liability side of our balance sheet and piles up a credit balance which is practically the same as surplus. At the end of the year the balance of the reserve we take over into the profit and loss account.

This method gives a sort of budget for the overhead. Some months the overhead will be lighter or lower than the estimated amount, and by watching the reserve for overhead one can see whether he is going over or under the budget. Then during the year, or every three months or every six months, he can change the overhead just about to balance the reserve account out at the end of the year.

I had one case where a concern had a strike during the year. Fortunately they had set up a little reserve in their overhead account, but during the period of the strike, which lasted about two months, the overhead account showed a debit balance. That was in May. By the end of the year, however, the red balance had been wiped out entirely. Thus during the year the concern used a constant overhead figure which balanced out the account fairly evenly at the end of the year.

The point I wish to bring out is as to whether a debit balance can legitimately be carried over as a deferred charge to be wiped out later, or should it be wiped out monthly or at the end of the year. I am looking for information particularly from the accounting point of view.

MR. LUTTERBACH: It depends entirely on what you are going to do at the end of the month. If you are going to set up a balance sheet and use it, you would have to write off the amount at the end of the month. If you do not intend to use the balance sheet until the end of the year, there is no sense in making the adjustment until that time. We use a somewhat similar system, our overhead being based on a conservative budget and the variation is very small. We make no adjustment until the end of the year.

ADJOURNMENT

THURSDAY AFTERNOON SESSION

April 28, 1921

Personnel Sectional Meeting

Chairman: E. S. COWDRICK

Colorado Fuel and Iron Company, Denver

THE CHAIRMAN: Among the industrial developments which in recent years have altered the whole face of American business, one of the most notable is the building up, for the benefit of employees, of a vast series of activities which have been promoted, discussed— and in some quarters condemned—under the general term “welfare work.”

The United States Bureau of Labor Statistics has defined welfare work as “Anything for the comfort and improvement, intellectual or social, of the employees, over and above wages paid, which is not a necessity of the industry nor required by law.”

The activities of employers for the “comfort and improvement” of workmen and their families are now of such wide variety and almost universal extent, that it is difficult to realize how huge a proportion of this development dates from a time within the memory of most of us. Nevertheless, to furnish a background for our discussion, it is desirable that we recognize the earlier experiments through which the pioneers of modern industry sought to express their interest in the well-being of their work-people.

In seeking the beginnings of employers’ activities for the betterment of the working and living conditions of their employees, it is necessary to go back to the industrial revolution in England. It would be unfair, however, to charge to the account of the then infant factory system, all the unfavorable conditions prevailing among the English workers at the close of the eighteenth century. Beginning with the reign of Henry VIII, the laboring classes of England, both those engaged in agriculture and those concerned with home manufacturing enterprises, had been in a condition of abject poverty, which the unscientific charity of the “Poor Laws” had mitigated only partially, and often to the advantage of the employer rather than to that of the workman. Gradual changes in industrial conditions spread over two or three centuries culminated about the close of the eighteenth century in the rapid succession of inventions which in a little over twenty years revolutionized English manufacture and started the modern factory system.

The newly built factories found an abundant supply of labor made

helpless thru poverty and unemployment. Organized society as yet had devised no system of factory supervision. As a natural consequence many abuses developed, including starvation wages, long hours, unsanitary surroundings and the unrestricted labor of women and children. Under a peculiarly vicious system of apprenticeship, pauper children were turned over to the manufacturers and held in virtual slavery.

It is noteworthy, in view of the beliefs of one school of labor philosophy, that the recorded attempts for relief did not come thru the efforts of the workers themselves. The pioneer reformer of that period was Robert Owen, an employer. Owen in 1800 became manager of cotton mills at New Lanark. Impressed with the wretched conditions of the workers, he embarked upon extensive activities along lines strikingly similar in principle to those of our modern welfare work. He opened pleasure resorts for his workpeople, ceased the employment of young children, improved homes and established sickness and old age insurance funds.

About this time an epidemic in the Manchester district alarmed the public and resulted in the enactment of a law "for the preservation of health and morals of apprentices and others employed in cotton and other mills". Among the other reforms prescribed in this bill was the limitation of child labor to twelve hours a day, although this limitation did not apply to children residing near the factory and under the control of their parents. With this law began the long series of English factory legislation which has extended up to the present time, and has taken the reform of working conditions largely out of the hands of employers.

In America, traces of employees' benefit activities appear simultaneously with the industrial revolution in England. The first American cotton mill was erected at Pawtucket, Rhode Island in 1790. Others soon sprang up at various points in Rhode Island and Massachusetts. These early factories were built along streams in order to take advantage of water power, and thus they were often remote from established towns. Americans had heard horrifying stories of conditions in English factories, and had a prejudice against factory work. This made it necessary for the manufacturers to provide good houses, and give attention to the living and social conditions of the men and women who worked for them. As a result some of these early mill villages were almost models of sanitation and comfort, and the employers gave attention to the domestic life and morals of their employees. In particular the dormitories and boarding houses for girls and unmarried women were under strict supervision. Even the dwellings of families were subject in a greater or less degree to regulation by the employer and landlord.

In the course of time the workers came to resent this form of patern-

alistic benevolence. This change of feeling, coupled with the increasing employment of European immigrants having different standards of living from those of the native workmen, broke down the early attempts at social improvement. The workers, many of them with relief, left the comfortable houses owned by the employers and moved into much poorer dwellings rented from independent owners.

Thus through the early years of the nineteenth century attempts of employers to improve the living conditions of their workmen largely were discontinued. Labor reform was left to legislation, and to the efforts of the trade unions, then just reaching a stage where their influence began to be potent.

In the course of time employers found evil results from this policy of indifference, and a few hardy pioneers of our own generation began experiments in housing and other efforts for the social advancement of the workpeople and their families. Thus was begun the present day movement which has carried social betterment work, in some form, into practically every industrial community of the country. It is probable that the development of scientific management, with its emphasis upon the human equation in productive processes, played a greater part in this movement than is generally recognized.

In modern practice, social service for employees includes almost everything that forward looking employers have been able to think of along lines of housing, hygiene, education, recreation, and working and living conditions. It is organized in ways as numerous as the opinions of its promoters. Sometimes it is made a part of the functions of an industrial relations department; sometimes it is administered by the operating officials; sometimes it is magnified to a distinct department of the company; in other industries it is related to the medical department. Frequently industry enlists the aid of agencies such as the Y. M. C. A. or community service.

With this variety in organization occurs almost as great a divergence in the principles upon which service activities are based. At times the well intentioned paternalism of the employer has gone to an extreme which was quickly resented by the more independent type of workmen. In other enterprises improvements in working, living and social conditions have been brought about through the most democratic cooperation between employees and management.

In this day when American business is taking stock of costs, and examining the efficiency of methods with a minuteness to which it long was unaccustomed, it is appropriate that The Society of Industrial Engineers has set aside a part of its annual convention for a discussion of the subject, "Does Welfare Work Pay?" This is not a one-sided question; not one

upon which the verdict is settled before the argument begins. We are not setting up a man of straw simply to be knocked down. There is genuine divergence of opinion upon this subject even among the employers most interested in conducting their industrial relations on a basis of generosity and fair dealing. Many employers are honestly in doubt as to the extent, if at all, to which they should conduct social betterment work in their enterprises, and not a few of these employers are awaiting our conclusions as a guide in their future policies. With this uncertainty and divergence of opinion among experienced employers and administrators, The Society of Industrial Engineers is in a position to render a real service to American business by its consideration of our subject, "Does Welfare Work Pay?"

We had hoped to have with us Mr. D. W. K. Peacock, Personnel Director of the Philadelphia Co., Pittsburgh. Mr. Peacock, however, wrote that he was unable to be here but he sent in his paper and I have asked Mr. Frank I. Barrus of Rock Falls, Ill., to read it to us.

"DOES WELFARE WORK PAY?"

D. W. K. PEACOCK

Personnel Director, Philadelphia Company, Pittsburgh

To begin with I am very much opposed to using the term "Welfare Work" and, therefore, I propose "Employees Service" as a substitute, which term will be used throughout the remainder of this paper. Welfare work has come to be considered as charity and most self-respecting men are opposed to receiving charity.

This question is one which I feel can hardly be answered in general terms, without a fairly definite knowledge of the specific problems existing in the plant, company or industry under consideration. There are many factors entering into welfare work and these factors may be such that they will entirely change the complexion of the problem as it exists in an individual company or plant.

In its broadest meaning, welfare work includes anything and everything which tends to improve the condition of society as a whole, or any individual member of society. If such a generalized definition be accepted, we are forced to include a large number of charitable agencies and we are also forced to include some of the combinations of big business which, in the past, have contributed materially to the advancement of society, even though at the same time doing an injustice to some men.

I believe, therefore, we will have to attempt another definition and for the purposes of this paper, we will consider employees' service work in an industrial company to be the acts of individuals and of agencies for the

purpose of bettering the conditions of work, health, family life and community life of the workmen in that plant. A few of these agencies are :

- Industrial housing schemes
- Medical service
- Nursing service
- Mutual sick and accident relief associations
- Employees' social organizations
- Co-operative stores

and many others.

It should be recognized that all men have in common, certain fundamental instincts which must be satisfied if their life is to be adequately rounded out. Tead and Metcalf, in their book on "Personnel Administration", list the following, which they style as "human values in industry".

- Bodily integrity
- Love of family
- Creative impulse
- Desire to possess
- The value of curiosity
- Desire for association
- Desire for approval
- Desire for justice
- Love of beauty
- Love of goodness

Employees who have a chance to round out their lives by satisfying these fundamental needs of their nature will become men and consequently better citizens and employees. Employee service work accomplishes these ends.

In an endeavor to satisfy some of these primary desires and industries of men, many progressive employers are gradually coming to the realization that, in large scale industry, there must be machinery especially adapted to care for the human element. During the past years, many attempts have been made to find the solution and in very many cases, these attempts have been uncoordinated but nevertheless quite successful. In other cases, whether coordinated or uncoordinated, they have proven of little value or even positively harmful. Personnel Departments are gradually being organized and in some of the companies, these departments are charged with considerable responsibility in securing, training and maintaining a labor force.

Much of the work of a personnel department, if it is really to have control over various functions which have been outlined as a part of such an organization, will be of a quasi-efficiency nature. In other words, in

hiring a man, the employer is interested in getting one who will render services worth the wages to be paid. The function of employment is in reality that of purchasing the most efficient services at a reasonable rate of pay. The situation changes when a new employee becomes a part of the organization. He should then be considered a part of the industrial family and be treated as such. A progressive company will make provision such that its individual employees may get adequate training, the better to perform their duties, to fit them for protection and to make them worth more money to the company, to themselves and to their families.

I believe you will admit that proper selection of new employees is profitable to the company which does it right.

Another function of a well thought-out scheme for handling employees is medical attention. If this be really adequate, it may or may not include medical service in the home. In fact, in a majority of cases, medical or nursing service in the home would hardly be a proper function of the employer and would probably tend to pauperize employees. However, there are certain fundamental responsibilities resting upon the management of any industrial company. Among these may be mentioned:

1. Responsibility that working conditions are satisfactory from the standpoint of safety, sanitation, light, reasonable tasks, and fair working hours. Much of this should be looked after by a competent physician.

2. The employer is responsible that, in case of accident or sudden illness while on duty, adequate medical attention is available with the least possible delay.

3. The company may, without in any way exceeding its proper scope, encourage health education among its employees.

4. It may take an active constructive interest in betterment of the community in such matters as decent housing, community sanitation, play grounds, parks, school facilities, water supply and many other factors, some of which should be of very great interest to the company's medical staff.

Adequate medical attention with a certain amount of plant and home nursing, primarily of an advisory character, has proven to be an agency which will reduce sickness, maintain health, and in that way not only reduce absenteeism but will produce more capable employees who will do more and a better quality of work. In a plant of say a thousand men or more, there is no doubt but that a full time physician can be used very profitably.

The desire for association with, and for the approval of one's fellows, is fundamental on the part of almost all men. This desire for association

is not promiscuous, but it can be directed. As a natural result of working alongside other people, a man will form likes or dislikes. A very real problem of the company management is to encourage the forming of "likes", and to prevent, insofar as may be possible, the friction which is caused by animosity on the part of one worker toward his fellow-worker. Many forms of employees' associations have, at various times, come into existence. We have the modern trade unions, shop committees, social organizations among employees, mutual benefit associations and others of less importance. Without entering into a discussion of the merits or demerits of trade unionism, shop committees or any other form of voluntary association, it is nevertheless true that an association of employees, operated by them and in their own interest, for the promotion of better working conditions, better conditions in the community and in the individual home, for the promotion of self-education, social intercourse, and a feeling of friendliness among all employees, is of great value. If, to the above, can be added, either in the same organization or in a separate one, some agency by which the employee may insure against sickness, accident or death, the association becomes of immediate practical value as well as carrying with it the other values previously mentioned.

Progressive employers are actively stimulating and assisting in the formation of associations which are designed to fulfill these needs and which are safeguarded against certain obvious evils. In some cases, the entire management of the company takes an active and equal part with individual employees in the management of these associations, contributing on an equal basis and having only an individual vote. These associations have in the main, proven of considerable value.

The training which some men secure by virtue of holding office in an employees' association is a remarkably efficient means of developing executives. In addition to developing executives, it improves the morale of the employees and will cut turnover cost to an extent far in excess of the total cost to the company.

Love of beauty is an instinct or feeling which many men will not admit possessing, nevertheless, it has been found that clean, light and airy workrooms, well kept premises and buildings not only aid in securing a better class of workers but have a positive influence on the mental and the physical well-being of the workers in such a plant. They are happier and do better work.

It will seem that this general attempt to satisfy certain of the human desires and instincts by constructive attempts to meet certain needs also tends to satisfy others equally fundamental. The creative impulse is given scope and assisted in its development by an educational program and this

same education contributes to satisfaction of the desire to possess more by increasing ability and, therefore, increasing the money value of the individual's service. It furnishes a means whereby the curiosity of the individual regarding the fundamental facts and theories underlying his work are satisfied.

It must be admitted that in most industries, as now organized, little latitude is allowed men for the satisfaction of the creative impulse by developing and putting into use ideas for the improvement of the industry. This is a situation which justifies constructive work on the part of the industrial engineer and others. The results to be obtained as proven by experience in isolated cases, constitute an untapped source of profit.

All of these methods, in tending to maintain and improve the physical and mental well-being of the employee, and to make him more valuable to the industry and to society as a whole, contribute to the fundamental desire of the employee to love, protect and support in a better fashion, his wife, children and other dependents. In addition to aiding the employee to better his own condition, the community is improved also. This attracts a better class of workmen.

A very important factor, not heretofore specifically discussed, is development of the personality of the individual worker. In the cultivation of such values as personal pride, civic interest, interest in his company and the industry as a whole, lies in the beginning of development of his initiative and ability to become an executive. I feel that, for the purpose of this discussion, we hardly need go into the matter of development of personality, save only to point out that a constructive program will inevitably lead to the above result.

Any program, called by any name whatever, will be worse than useless unless it is founded upon justice and a real desire to be of service to employees and the community at large. Many expedients have been adopted, and some of these expedients emphasized justice particularly, as in representation plans, but some have not secured the desired results through failure to "do unto others as we would have them do unto us." This matter must be handled in a spirit of mutual respect and confidence and with the desire to be of service to all men. If there is the will to cooperate, the way is relatively unimportant.

This matter of employee service work cannot be separated from the whole problem of industrial management. Welfare work of the kind which is confused with charity, is worse than useless. It is expensive to the company at any price. On the other hand, constructive welfare work, which betters the conditions under which a worker exists and enables him to take care of himself and family without charity, is worth all it costs.

To sum up, anything which promotes the progress of an employee will in turn contribute to the progress of the company for which he works. There is no such thing as standing still. We either progress or we go backward. If a man, submerged in a multitude of other employees, feels that he has no chance to develop his personality and to become of more use in the community, he will surely become of less use. The company which has a body of employees who have lost heart, can hardly expect to make progress. It, therefore, behooves us to develop the personnel in industry.

At the same time, in developing the personnel of the company, we must not lose sight of the fact that sentiment, valuable as it is and necessary as it is, cannot be the sole guide. We must take care of the employees in every way possible, or better still assist them in taking care of themselves. If we assist them by various methods to develop and progress, they in turn will produce a continuously increasing profit for the company.

I should like to propose two or three questions, for discussion:

1. Which forms of welfare work or employees' service work, are really the most profitable?
2. How can this proposed welfare program be announced and carried out without any use of the word "welfare"?
3. What mistakes are personnel executives likely to make?

I wish to thank you for your consideration of these matters, and certainly expect to gain considerable of value from the proceedings even though I am unfortunately not able to take part in person.

THE CHAIRMAN: I am sure we are under obligations to Mr. Peacock for preparing this paper and also to Mr. Barrus for being kind enough to read it to us.

We also have another disappointment. Mr. A. L. Rose, Service Director of the Kelly-Springfield Tire Company of Cumberland, Md., wrote that on account of the serious illness of his wife he would be unable to be present. The paper by Mr. Peacock, therefore, concludes the formal part of this program and the meeting is now open to general discussion along the lines of Mr. Peacock's paper or along any other line bearing upon social service work to employees.

MR. F. P. WOY (Madison, Wis.): Perhaps the chairman would be willing to tell us something about the social service work conducted by the Colorado Fuel and Iron Company.

THE CHAIRMAN: The Colorado Fuel & Iron Company conducts its relations with its employees, under the industrial representation plan and it is largely in connection with that the company handles a considerable amount of social service work for the workmen and their families. Particularly, we have conducted a great deal of this work through the activities

of the joint committees provided in the industrial representation plan. These committees are made up of equal numbers of representatives of the management and representatives of the workmen and they handle these problems in a perfectly frank and fearless manner. They have brought about a great many very valuable improvements in working and living conditions.

The Medical Department of the Colorado Fuel & Iron Company which was organized by Dr. R. W. Corwin in the year 1881, and which is still under his direction, did valuable pioneer work along sociological lines in the early days and a considerable amount of this work still heads up in the medical department. Such of the social service work as the company conducts directly is handled through the industrial relations service. The same officers who represent the company in connection with the industrial representation plan also represent it in whatever social service work we carry on.

Our housing condition, we believe, is a rather important factor in this work. We, in addition to our steel works, have about twenty coal and iron mines, practically all of which are in isolated communities where it seems necessary for the employer to furnish the houses. These houses have been built for the employees, rented to them at low rates, and, particularly in recent years, have been brought up to a high standard of comfort and convenience. All of these houses are fenced.

Our club houses are operated by the industrial department of the Y. M. C. A., which has done what we consider a very valuable piece of work for the company and employees.

MR. F. P. WOY (Madison, Wis.): Which of the social service benefits does the employee lose in case of strike? Does he lose the medical service, any pension, or anything of that kind which you are giving?

THE CHAIRMAN: He does not lose his home unless he stays out on strike so long that his position becomes permanently vacant and someone else is employed in his place. He does not lose his pension rights under our service retirement plan because a man is given credit for his total service with the company regardless of how many times it may have been interrupted. During the time he is actually off the payroll I think he would lose his medical rights, although I don't remember that that question has ever been raised. In recent years we have had few labor troubles and they have been very brief, and I don't know that that question as to the man being entitled to medical service while on a strike has ever come up.

MR. WOY: Do you provide medical service in the home while a man is off the job?

THE CHAIRMAN: If he was laid off because of lack of work or

some reason of that kind, we undoubtedly would, and do. At present a considerable number of our employees are off duty temporarily, but they are considered employees and would come under the medical service.

I should explain, in all fairness, that our medical service is not entirely free. Each employee who is at a place where he is within reach of the company doctor is required to pay \$1.50 a month for this service for himself, and in most cases at the mining camps, for his family. This \$1.50 a month is supposed to pay the expenses, and, while it does not pay the total expenses, it goes toward it.

MR. J. C. LINDSEY (Seattle, Washington): Do the visiting nurses employed by the company go into the workmen's homes without invitation, and has their action in that direction ever been criticized?

THE CHAIRMAN: They do go into the workman's home without specific invitation, naturally. I have no recollection that there has ever been any criticism of that action.

MR. WOY: How is this social service organized under the company's organization? Is the medical department related to the so-called welfare department, and is the employment bureau related to it in any way through general supervision?

THE CHAIRMAN: That is rather difficult to answer without going somewhat back of your specific question. All of the industrial relations and personnel work is under the direction of a vice president, A. H. Lichty. That includes such social service work as is directed by the company. The medical department is independent and the visiting nurse work is under the direction of the medical department. There is a very close cooperation between the medical department and the industrial relations and personnel service, but neither one is directly in control of the other.

MR. WOY: How are the cooperative stores worked in connection with that?

THE CHAIRMAN: We have none. We have company stores, operated by a subsidiary company at most of our properties. These stores we have found advisable and in some cases almost necessary in order to provide our employees with a place where they can secure good merchandise at reasonable prices. They are not required to trade at those stores—they may trade wherever they wish.

(Mr. Woy was asked about his work in connection with the Denver Tramway Company.)

MR. WOY: I cannot add much to this discussion because in my work I did not come into the personnel work or social service work directly,—I saw it more or less directed by others and I was connected with it only in its relationships with our other problems.

I am referring particularly now to work during the war period in the Denver tramway. We had about 1500 men and had mutual benefit associations operated in conjunction with the company by the employees. Under the personal direction of the employment department, the employment man carried on, insofar as he could, the social service work, but it was not termed that in any way. Each separate line of work was given a distinct name.

Club houses were organized at each one of the five divisions, bowling alleys and all equipment were put in by the company and at their expense and turned over without rent to the clubs. Those clubs were very popular in that particular work, especially because each one was located at the shops. The south division clubs, where are the shops where we build our cars and things of that character, were the best patronized probably, but the least attractive of any. The social success of the clubs and things of that sort does not seem to go with the amount that the company spends to attract them into those lines—there doesn't seem to be any relationship between the two.

The medical department was operated in conjunction with the employment department and as one passed through the employment department, he immediately passed into the medical department, where he went through the physical examination of strength, lung power, and took physical tests of all character—examination internally and externally, you might say, because of the fact that this also covered the motermen and conductors, men whose qualifications were somewhat different from what you found in the usual shop.

There was an insurance plan put into effect and a great many other lines of work were carried on for the men. The company carried on all of this work very successfully but it didn't seem to be the method of holding the men and keeping them directly tied to the company insofar as their moral support was concerned in time of trial.

The men were not organized up until during the war, when they joined the national union and soon after that, on account of the company troubles when rates of fare were not raised in keeping with the increasing expenses, the company was threatened with a receivership, and then came the War Labor Board which raised the wages very materially, and the result was that the company, as ultimately would happen, went into the hands of receivers about the first of this year.

Just before that, however the company appealed to the local community to help them to a higher fare but the city council refused it—they having the home rule power to refuse an increase in fare over the franchise, and the result was that it was necessary for the company to cut the wages of

the men and as a consequence there were troubles in which the Denver Post was wrecked, a number of lives lost, and there was a great deal of damage, all followed by the receivership the first of the year. I am advised that within the past few weeks, following the receivership, the fares were raised.

But in general, my conclusions were that this personnel work benefitted the company so long as the men were satisfied, in the first place. In the second place, it did hold some men so that they tended to keep away from organizations of a national character where they would be beyond the control of their own local organizations and where their own local interests would be lost in the national rulings. For that reason, the motive of developing personnel work must be purely in the interests of the welfare of the men, and selfishly, insofar as the company can get better efficiency out of the men during the immediate period, but it does not seem to me that personnel work builds a future potential benefit for the company. I don't think the results of it can be capitalized for a longer period of time than the immediate future.

THE CHAIRMAN: Dr. D. F. Garland, of the National Cash Register Company, came into Milwaukee today and I am going to ask him to tell us something about the work at the National Cash Register Company.

DR. D. F. GARLAND (Dayton, Ohio): I believe profoundly in industrial welfare programs for this day and generation. Personally, I have not a question of doubt about the wisdom of introducing welfare work, and personally, I am not afraid of the name.

Mr. John H. Patterson, whom I represent, was one of the pioneers in welfare work in industry, introducing it about thirty years ago. We have discussed the question of changing the name times without number, and he is positive that the word "welfare" is about the best English word we can get, and we have no thought of changing it in our own industry.

Why do we believe in welfare work? We believe in welfare work for two reasons—first, because it is just, and secondly, because it pays.

We believe in introducing welfare work in industry on the basis of justice to the people who work and on the basis of justice to the people who employ and furnish the capital, and then our experience has been that it pays. Therefore, we are absolutely satisfied to continue the program and to enlarge it rather than to reduce it.

Why do I personally believe in welfare work for this day and generation? We had better remind ourselves of the fact that we are all interested in wealth—exchange value of things. Wealth is produced by three factors, political economists tell us—the raw material, the human factor and the capital. Capital is merely the accumulated result of the application of industry to the raw material. These are the three factors that go into the production of wealth.

You remember that at the close of the last century we had a great movement which looked towards the conservation of the natural resources of this country. We said that unless we stopped wasting land by failing to fertilize it and not cultivating it, we would find ourselves in the position by and by where we would not be able to produce enough for our own people. Do you know that we are importing food now? And we said that at the close of the last century! And yet we have not begun to cultivate over two-thirds of the land of this country. We had a great movement to conserve one factor in the production of wealth; we split up one great political party on that fight and put it out of business for a while on that fight alone, because we thought it was worth while, and we won a great battle but we haven't finished it yet.

Then, at the beginning, of this century, we began to see that we were wasting the human factor—the second factor that has to do with the production of wealth; that our factory conditions were all wrong, hours of work were all wrong, housing conditions were all wrong, that our living conditions in the city were all wrong, not enough pay, no playgrounds—we had the wrong system of education. Didn't we find that all out? And then haven't we been busy for the last fifteen or twenty years in the great industrial work of this country in what we call industrial welfare work in order to conserve that factor?

And capital has the right to be protected and haven't we now, at this particular day, come to realize as we never realized before that capital is absolutely short in the world. We are short of credits; we haven't enough money, scarcely, to go around. We have enough cheap money to go around, but not good money. I just returned from Europe where I spent two months and it takes a sheaf of money in Europe in some places to really buy a day's necessities. We haven't enough money in this country and we have to conserve capital. So the capitalist realizes, the laborer realizes, the rank and file realizes that we must conserve these three factors—the raw material, the labor and the capital.

How are we going to do it? We are an industrial nation and we are going to continue to be an industrial nation—there is no doubt about that; and so we cannot step backward in this program and it is imperative that we continue it and develop it and put all the welfare work, the real constructive welfare work, into industry that we possibly can put into it if we are going to maintain our supremacy in the world of industrial development. Don't let's forget that Europe is coming back some day—she isn't back yet but she is coming back—and she is getting ready on the sea and land to compete with us for the world's trade, and the world's trade is in ships and the ships carry the raw product upon which labor has been expended

and in which capital has been invested in manufactured things. If we are going to maintain our supremacy, we have got to organize to the last degree in the conservation of capital, raw material and labor.

So much for the reason that lies at the foundation of the introduction of welfare work in our industry.

I want to tell you briefly what we are doing in the National Cash Register Company. You know why we are doing it—because we believe in it, and we are not going to stop it—we are going to spend more money on the program and not less.

In the first place, we believe in good factory conditions. When Mr. Patterson, very many years ago, remodeled his first factory, he told the architect that he wanted the maximum amount of window space in the building. When the architect came in with the plan of the building he had the old-fashioned factory building with much brick wall and very little window space. Mr. Patterson said, "All wrong. I won't have it", and he told the architect to cut the brick space down to one-third and multiply about three times the window space. The architect told him that he was not an architect, he was a manufacturer, and that the building would fall down. Mr. Patterson said that he would take all the risk and the architect was to draw the plan. And he did, and so the result of that is that in all our buildings, (we have some twenty-one or twenty-two,) ever since then we have put in the maximum amount of window space, with just a small bit of steel and brick and the balance of the space, windows so that there is plenty of light. And then we have introduced all modern factory equipment to take care of dust and all that sort of thing, and to keep the factory clean all the time. We believe, also, in keeping the outside of the factory clean and we have a park effect all around the factory with shrubbery.

Having provided first class factory conditions up to the maximum, then we believe in introducing another necessity into the factory life. You and I must eat to live. A man coming to a factory, carrying a cold lunch isn't nearly so efficient as a man coming to the factory who can get a hot meal, so several years ago Mr. Patterson introduced hot coffee and hot soup for the girls and then later on hot coffee and hot soup for the men, and later that grew into a commissary department so that today we feed about one-half of the factory help, the balance going home or to nearby eating houses. We furnish a first class meal with soup, meat and vegetables, drink and dessert for 35 cents in a first-class modern cafeteria.

We believe that pays—absolutely pays. The company charges nothing for overhead in the investment in these restaurants. We simply allow the men to run them and the committee of the employees sits with us and we determine the menu and the amount of money they chose to pay.

Then we believe in introducing welfare work in the form of medical service. We have two full time physicians and a consulting physician gives an hour every day, and we have a dentist and an attendant on full time giving emergency dental aid and looking after the teeth, with an examination once or twice a year. We have health associations which give us medical service and we have our nursing service with a complete equipment for emergency service in the factory—accidents and that sort of thing. We also provide the real Battle Creek idea. Mr. Patterson is a true enthusiast of the Battle Creek idea, even down to the eating of nuts and we have massages and hot baths and showers, needle baths, electric baths and all that sort of thing. The other day I had a cold in my head and I went up and got the hot applications and my head cleared up—on company time—and I could think sanely for the rest of the day. Mr. Patterson believes that the hour I spent in that room was a good investment for the company, because in the next three or four hours of the day I could accomplish more and make up the time lost in that kind of service.

We also have an educational program, a library with some 20,000 books and technical magazines of all sorts and these books are lent out as any library lends the books and magazines. We conduct night schools and two weeks ago we graduated 657 men and women.

We have provided a school house right next door to the office building, seating about 1200 people, and a little school house for small meetings, also having a projection department. We believe in teaching through the eye rather than by the ear. A gentleman said that from 70 to 80% of us are visual minded—that is, that from 70 to 80% of us get through the eye the major part of our education, and therefore it pays to teach through the eyes. We have spent nearly half a million dollars on our school building and a good deal on the projection department. Men and women come in during the lunch hour and we show them the latest moving picture news. Sometimes we bring a public speaker who delivers a first-class talk on health, recreation, government of the city, etc.

On every Saturday morning we have children's meetings and the children come and we give them an hour or an hour and a half of education or recreation and an apple and a cake when they go.

We believe that a factory owes something to the community in which it exists and out of which it makes its profit. We believe that we must build up the health and the well-being of the children of the neighborhood and so we use our school house for the children as well as for the grown-ups and we allow the school house to be used for the neighborhood as well.

And so we go through the whole thing in service in industry. All this might look to you like handing the men and women something for nothing,

and for a long time it did look like that, but Mr. Patterson believes that you must fundamentally start with adequate wages—you cannot introduce this system of welfare work unless it is founded upon an adequate wage system. That is, you must pay in your line of industry the maximum wage for the same type of work that is paid by any other industry in your line. The truth is that we pay more. We have always been unpopular with the industrial magnates of our city because Mr. Patterson paid too much. He made the minimum wage \$9.00 when our ten-cent stores were starting the girls in at \$3.00 and our big dry-goods stores were starting them in at \$5.00. Our minimum wage to the women now is \$15.00, and we believe that an adequate minimum wage is absolutely fundamental before you can introduce welfare work.

Secondly, we have introduced an advisory council in industry. By that we mean a body of men chosen democratically by the rank and file in industry to sit with the management and confer with the management about factory conditions, rates of wages, hours of work—everything that has to do with factory management and the management of the men and with the making the man efficient, and no man can vote or represent the rank and file in the advisory council if he has any executive position in the factory. These 25 men sit with the management, bring their complaints in and our men listen to the factory side and the representatives of the rank and file carry their report back to their men. They meet on company time and they spend an hour a week reporting their conference with the management. That brings about good relations.

But all that isn't enough. If we stopped there and did nothing more, then the men who worked would say that it was all for efficiency, for slave-driving, trying to get the work out of them so that we could get the maximum profit with maximum production. About two years ago we realized that and Mr. Patterson said that the time had come when we had to share the profits in the industry, and this is the way we share the profits: we get an outside public accountant who has no relation to the company at all, and he comes in and tells us what our net profits are. The net profits are arrived at in this way—first the owners of the industry are given 6% on the net investment which they have in the industry—7% on the preferred capital and 6% on the balance of the net investment which they have in the industry. The net investment is arrived at by taking into account the value of lands and buildings, the value of equipment, material and stock on hand and unsold goods and the surplus that is set aside, subtracting from the amount of borrowed capital (we always have something like two to five millions borrowed capital) and upon that—the net investment—the owners are given 6%. All of the balance of the net profits are divided

fifty-fifty—one-half going to the owners, they taking that money and putting it back into the business, into new equipment, better buildings, new stock, etc., or into surplus, and the rank and file get the other half according to responsibility—Class A, Class B, Class C and Class D. Those who have maximum responsibility are paid the largest percentage; those who have lesser responsibility are paid a reduced percentage, and so on down the line. A man needs to be in the factory 30 days before he can share in the profits and after thirty days he shares in the profits. Should he be discharged or leave the factory before the end of the profit sharing period, he receives his share of the profits, calculated up to the time that he is either discharged or dismissed.

THE CHAIRMAN: Some of you know that when this subject was announced—does welfare work pay?—there were some suggestions that the term “welfare” was not altogether acceptable to all people in industry, and I received some letters protesting against it. I wrote to Mr. Dent about it and he said that if we didn’t like the word “welfare”, it was all right with the S. I. E. if we selected something else. Acting on his suggestion I sent out letters to some more of my friends and acquaintances asking for a substitute for the term “Welfare Work”. I received a lot of answers, and these are some of the suggested substitutes:

- Personnel Service
- Personnel Service or Employees Service
- Self-improvement Work
- Personal Service Department
- Service Activities
- Cooperative Insurance
- Insurance Benefit
- Cooperative Benefit
- Philanthropic Department
- Service Work
- Employees Service
- Mutual Service
- Industrial Relations Department
- Employees Service Department
- Personnel Activities
- Industrial Service
- Industrial Relations
- Industrial Service
- Divisions of Personnel
- Cooperative Department
- Service

Welfare Work
Employees' Service Activities
Mutual Service Work
Industrial Relations
Personal Relations
Industrial Morale
Department of Industrial Economy
Betterment Department
Mutual Welfare Department
Cooperative Work
Employee Service
Employee Service
Industrial Service
Personnel
Association of Mutual Service
Division of Cooperative Service
Personnel Management
Social Cooperation with Workers
Keep Fit Plan
Cooperative Welfare Work
The value of attention to problems of Industrial Relations
Social and Recreation Activities in the Plant
Man Power Maintenance
Mutual Interest Department

MR. J. C. LINDSEY: Have you counted the number of times the word "service" occurs?

THE CHAIRMAN: I have not, but it seems to me that it occurs in about half of the suggestions.

MR. LINDSEY: I should say that it has occurred in more than half.

I think that is a question we should discuss and come to some decision on. I think it's due the Society. The work that Dr. Garland describes is the kind of work we would all like to see installed in all of our plants, and his name for it is "Welfare Work". If that were the only plant of its kind in the country, there would be no criticism of the term, but the ideal of welfare work has been abused and has been made paternalistic and to such an extent that the term is criticized. Our men do not like to have it used. The answers you have to your letters clearly indicate that they prefer some change. It would seem to indicate, also, that the word "service" is more popular in the new term to be determined upon by us than the word "welfare."

Why can't we accomplish something definite in the way of a decision by an expression of this meeting by vote? First, are we to accept the old term of welfare work as describing what we want to do through that work, or shall we have a new one? Assuming that it is decided to have a new term, should the word "service" be substituted for the word "welfare"?

DR. D. F. GARLAND: Doesn't labor resent the term "welfare" because they found in some cases welfare work has been used in place of adequate wages?

MR. LINDSEY: Absolutely, and a good term has been abused so that it has gone wrong. Can we get away from that idea and show them that what we want to do in these things is for the benefit of the men and the management both, but not in a paternalistic way?

(After some further discussion it was voted unanimously that a new term ought to be substituted for "welfare work" and that the word "service" should be incorporated in any term selected. The following suggestions were made by members present: mutual service, personal service, industrial service, employees' service.)

MR. CHESTER LORD (Battle Creek, Mich.): My feeling in regard to personnel work, and the feeling in our factory is that we are not giving anything to the men that they are not entitled to, and are not doing it for the personal benefit of the concern; doing it because we have the power within our hands to offer service to them and have the power to overlook the entire plant while they are busy with their individual jobs and we can collectively act on all of them while they cannot. We are there for service.

We want employees to come to us if they have questions regarding household finances, regarding investments—in fact, in regard to all their troubles—and we want them to feel that we as a concern are not getting anything out of it, other than what we get out of life by living life in the right way. For that reason I would like to put in a plea for the term "Employees' Service" as against the term "Mutual Service".

The final vote was in favor of "Mutual Service", which was declared the official term of The Society of Industrial Engineers.

ADJOURNMENT

Educational Group**THURSDAY AFTERNOON SESSION****April 28, 1921****Chairman: EDWARD J. KUNZE****Head of Department of Industrial Engineering
Pennsylvania State College**

THE CHAIRMAN: Whether it be in the design of a machine or a power plant or a factory or a personnel system, the engineer always carefully lays down the specifications of his projected product before he starts on the actual work of producing that product, and he must in laying down the specifications for our industrial engineering graduate, think of these things carefully. The Program Committee in designing our topic this afternoon wisely carried out this policy and divided our subject into two parts: In the first part we ask ourselves, what do we want? In the second place, how may we best secure what we want?

I do not wish to impose a speech on you, nor is it my duty as Chairman of the meeting to do so, but I cannot forego the opportunity of raising some of the questions that it seems to me will be important and will be necessary for us at some time to decide. There are many questions involved beside just what subjects should be taught. The manner of teaching these subjects, the objective desired, and the administrative problems are all as necessary of consideration as are the subjects themselves.

College curricula must be constructed to fit into the limitations of class rooms and laboratories. The work of the several instructors as given in the various terms or semesters of the college year must be balanced as far as possible; the work of any one department must be correlated with the work of other departments and lastly, there are certain general restrictions usually imposed upon any department of a large college or university, such as the requirements to teach certain subjects or the restrictions in teaching other subjects, due to the limitations of preparatory schools at the present time and other similar considerations.

There are many reasons why all of the suggestions presented by the individual may not be adopted directly without modification, but those to whom the work of instruction is entrusted are glad to receive suggestions and constructive criticisms from others either collectively or individually at any time.

At the Pennsylvania State College there has been established an an-

nual industrial conference to which many men representing various lines of industrial organization work are invited to come and spend two or three days. At our next industrial conference which will take place in June of this year, we expect to have at least thirty representatives of various industries throughout the eastern part of the country at the college. At our summer session in industrial organization and administration for factory executives, men come from the industries and spend two weeks with us in intensive work in industrial engineering subjects. Frequently other visits by representatives of industries are made to the college, sometimes singly and sometimes collectively. Recently the representatives of nine factory organizations were present at the college at the same time. No longer can it be said that the college is not in touch with the need of industry.

Yesterday we heard of a number of the characteristics that are desired of the industrial graduate. Some time ago a questionnaire was sent out to the leading executives of many of our industries and it was found that the qualities most desired of engineering graduates by the executives representing these industrial organizations were as follows: I give the percentage of importance as laid down by these men:

Character.....	24%
Judgment.....	19½%
Efficiency.....	16½%
Knowledge of Men.....	15%
That is a total of 75% for the personal qualities.	
Knowledge of Fundamentals.....	15%
Technical Knowledge.....	10%
TOTAL.....	100%

It may be pertinent to remark that in no course of study more than in the industrial engineering course is this balance of importance so carefully followed out. Not merely by adding a course can culture be acquired. A habit of mind is not attained merely by studying a text book. In our work, the work of the industrial engineer, I feel that this matter is of even greater importance than in other engineering branches. I believe it is established that an engineering training is important to all positions of organization and of administration, particularly such as are of a technical nature.

The first city manager was an engineer. The first business manager of a university was an engineer. The first organizer of food distribution on a world-wide scale was an engineer. The successful completion of the Panama Canal was due not so much to technical ability as to engineering executive ability.

Engineers are now occupying positions as college presidents in a number of colleges, and had a certain engineer really desired the position of Chief Executive of these United States, there is little doubt but that there would now be an engineer in the White House.

The question is not so much, "Shall an executive have an engineering training?" as it is, "Of what shall that training consist?" There are many who will agree to the first part of our question, but who rather doubt the necessity of including many subjects that may be difficult and perhaps not directly pertinent to industrial engineering.

Can a student be better prepared for industrial engineering work by reading certain books after graduating in other lines of engineering or by selecting certain courses in industrial engineering in his senior year, or can he be better prepared by taking a regularly designed industrial engineering course in which he receives some industrial engineering instruction in his freshman year and thereafter increasing amounts of such instruction until his graduation? Can a habit of mind, a method of attack, an industrial engineering sense, if you please, be developed in one year or must it be assimilated gradually and continuously?

I have mentioned the list of desirable attributes attained by canvassing the industrial organizations of this country. It will be seen that to character is given nearly one-quarter of the entire percentage. Can character be better taught by adding courses in ethics to our curricula or in developing truth, fair dealing, self-restraint and similar virtues by fostering student self-government? Can responsibility be developed except by throwing responsibility upon the student? Can judgment be better taught by a course of study or by the constant call for exercise of that judgment throughout the student's course in college? These are a few of the things we must answer before we have gone very far in the solution of our topic.

It gives me great pleasure to introduce as the first speaker of the afternoon, Mr. S. E. Stout, Betterment Manager of the Whiting Corporation, Harvey, Illinois, who will speak to us on this topic.

MR. S. E. STOUT (Whiting Corporation, Harvey, Ill.): When I was asked to speak upon this topic I hesitated before accepting the invitation, for I knew that the other speakers were educators and I hesitated to come as a layman or a shop man and speak to them upon educational topics. In a meeting with educators I feel that my real position is as it was in the college. When I was in college the only dealing I had with the professor was when I was called on the carpet in his office. I hope you will not want to send me to the Dean's office when I get through with this paper.

The topic first given me was, "The Qualities which Make a Successful

Plant Executive". After that topic was assigned to me it was discovered that two or three of my good friends were speaking on the same topic the day previous, so I was asked to speak upon the topic, "What Industrial Leaders Require of the Graduates when they Employ them after their Graduation from the University"

"WHAT INDUSTRIAL LEADERS REQUIRE OF THE GRADUATES WHEN THEY EMPLOY THEM AFTER THEIR GRADUATION FROM THE UNIVERSITY"

S. E. STOUT

Betterment Manager, Whiting Corporation, Harvey, Ill.

I am informed that it is my duty to speak, as a representative of Industry, of the qualities which we expect to be possessed by the college graduate when we hire him with a view of developing him into a Plant Executive.

This is a pleasure for I have great confidence in the average graduate of the American college, and I have faith in the methods of the faculties of our American Colleges. When we observe the stupendous things which our graduates have collectively and individually accomplished, we must agree that the methods of our colleges cannot be far wrong.

We have, however, a great task before us. That task, the training and development of Plant Executives and Industrial Leaders, is not one which we, the representatives of industry, have a right to leave entirely to colleges. In fact it is not desirable for industries to ask Colleges to give them Plant Executives; but rather the Industries should ask the Colleges to give them men whom they can develop into the executives and leaders which they require. It is the duty of the Industries to develop qualified men into Plant Executives.

The College has, however, a function in the development of the future plant executives which Industries have a right to ask of them.

The future of our Industrial life depends largely upon the success of the Colleges in performing this function.

This function, of the American Colleges, is to give to Industry men who have those basic qualities and tendencies which are necessary in order that Industries may be able to develop these men into the executives and leaders required.

We cannot expect greater capability in the graduate than there is in the faculty which develops the men. Therefore, before speaking of the qualities of the men, Industries have one quality to demand of the College and that is that it shall be capable of developing the American young man into the graduate required by industry.

Industry has four principle qualities to demand of a graduate.

We are speaking of graduates who are employed for executive positions. There are opportunities for every graduate who possesses any degree of manhood and ability.

But for men who expect to become Plant Executives and Industrial Leaders we must impose rather definite requirements.

The first and the greatest quality is:—

“We expect the graduate to be a **man**”. We have the right to ask the college to develop for us graduates who are **men**, and to keep from us, as far as it is within their power, those students who are not men.

When we ask a graduate to be a **man**, we are asking that graduate to be clean, wholesome, clear minded, manly, honest and appreciative of his fellow men, and preferably strong, healthy and robust.

These are the qualities which all men have a right to ask of their leaders and Industries cannot afford to experiment with questionable men. The inefficiencies and loss of moral caused by “negative” men and by the process of weeding out such men are too disastrous to be attempted. Attention to this and the following qualities will, I believe, remove much of the opposition of Industrial leaders to College men.

The second requirement may not be a quality, but it is as important as a quality, that is:

We expect, broadly speaking, the graduate to enter his right sphere of activity.

Every American boy has a right to a career, but each Industry has the right to ask that the experiments of finding his right career shall not be in the Industry.

It is a function of the College to eliminate this waste of personal ability and of industrial efficiency by helping the student to find himself and his right field of activity.

It is the duty of Industries to advise the Colleges of their requirements and to cooperate with the Colleges in the development of men.

The third quality which is asked of the graduate is:

He must have developed character, ability, capacity to develop further, and capability to utilize his abilities.

Under character we include:

Attractive personality.

Integrity and loyalty.

Responsibility.

Common-sense, and a proper attitude and

A desire to be of service to fellow-men.

Under ability we include:

Judgment and perspective.

Resourcefulness.

Initiative.

Personal efficiency and fearlessness of hard work and

Understanding and appreciation of men.

Under capacity we refer to the graduate's power to assimilate and utilize his observations and experiences and the teachings and writings of others.

Under capability to utilize his ability we include:

The developed leadership of men.

The actual participation in the affairs of men and

The accomplishment of results in as far as these can be expected of young men.

We have no right to expect the average college graduate to have all these many attributes thoroughly developed, for time and experience is necessary to accomplish this, but we do expect correct tendencies to have developed toward each of the requirements.

The final quality which is asked of the graduate is that he shall have a thorough fundamental education. No Industry has a right to expect Colleges to train men for its individual peculiar need. Any tendency to make education narrow should be thrown aside. Industry has the right, however, to expect the graduate to be trained for some definite purpose. That is, he should be qualified to occupy some position which is common to many Industries. The graduate who knows a little of everything, but nothing in particular, is of no particular value to the average Industry.

Industries expect the graduate to be able to occupy a definite position and to have training in those fundamentals which will permit him to understand the work of other men and to assume greater and increasing responsibilities as the opportunities are offered.

In particular the graduate should have had included in his schooling a definite class of industrial work, such as engineering, accounting, production, etc., which will prepare that graduate for a definite class of positions.

In addition he should have been given a thorough fundamental training and understanding of capital, men, materials and the forces of nature, so as to prepare him for growth, development and advancement.

As stated previously, Industries should not ask the Colleges to furnish executives, they should ask for men who are qualified to become executives.

To develop executives, Industries must provide many opportunities which colleges are not able to give. These include:

Extended experience with men.

Experience in handling management problems, policies and affairs.

Experience in judging facts and in making decisions and

Experience in accomplishing results.

In closing may we again state that the future of our Industrial life depends, largely, upon the work of the college faculty. But we, the Industrial men are not fearful, for the College has capable material in the average American Boy and the American College is amply able to develop this boy into the man that is needed.

THE CHAIRMAN: I am sure that we appreciate the very able paper that Mr. Stout has given us and the way in which he has brought out the fundamentals that we are looking for.

The next paper should have been given by Professor Hugo Diemer now of the LaSalle Extension University of Chicago, who was for many years connected with the Pennsylvania State College; in fact I believe he was the founder of the first course in industrial engineering fourteen years ago. Mr. Diemer is ill at the present time and he is not able to be here, so I have asked Professor Larson, Chairman of the Department of Mechanical Engineering, of the University of Wisconsin, if he would not consent to read Professor Diemer's paper.

PROFESSOR HUGO DIEMER

La Salle Extension University, Chicago

Mr. H. G. Wells, in one of a recent series of papers in the Saturday Evening Post entitled: "The Salvaging of Civilization" says, "If you look back into the lives of the Pilgrim Fathers or into those of the great soldiers or statesmen of Cromwellian England, you will find that these men had a sense of personal significance, a sense of destiny such as no one in politics or literature seems to possess today".

The leaders of that era were inspired by the desire for religious and political freedom. To them representative government meant a clear vision of the responsibility and obligations of the representatives of the people, no matter how elected or appointed as the custodians of the rights of the individual.

In America today most of the school-educated members of the community are ready to modify the statement that all men are created equal. They will concede that all men are entitled to equal opportunity but will hold that all men are not equally fit for leadership, and that because of this inequality our forefathers with wise foresight devised constitutional and representative government as more lasting than direct democracy.

But most of us will agree with Wells that our representatives today do not have the sense or responsibility that characterized our forefathers—we will fully concede that they do show a sense of responsibility to the leaders of the party or the class most instrumental in placing them into their positions. But this responsibility to party or class is something quite different from responsibility to the community and responsibility for equal rights and opportunities for all members of the community.

If this sense of responsibility to the community's interests does not exist in our public officers, what wonder that it does not exist in the minds or actions of our commercial or industrial executives.

And yet, not only the success but the very existence of industry and commerce depends today more than ever on the recognition of the rights and opportunities of the community and every individual in it by those who are framing the policies of industry and commerce.

On April 17th, a report was made to the President of the United States by Huston Thompson, Chairman of the Federal Trade Commission that indicates a clear insight into the dependence of business success on a fair deal to the individual citizen. Few papers have given this report the publicity it deserves. In fact, the report is likely to be ignored by newspapers who see in it an affront to what they deem a business administration.

The short sighted advocates of a so-called business administration fail to realize that temporary privileges to profiteer accorded to favorite industries or commercial enterprises may be the very cause of the failure of these enterprises, whereas regard for increasing individual wealth and individual purchasing power thru lowered costs to the consumer will put these same industries and commercial enterprises on a permanently prosperous basis.

Trade statisticians such as Babson and Bradstreet tell us that for every 100 persons engaged in 1914 in distribution namely in wholesaling, jobbing, retailing, selling, and advertising, we have in 1920—350 persons so engaged. The net concrete increase in production in the same period is less than ten percent measured in bushels of grain or tons of metal—so that our efficiency of distributing agencies is today as compared to 1914 as 110/350 is to 100/100—or in round numbers—30 per cent. In other words measured by the gross sales and number of people in selling and advertising we are today 30 percent as efficient as we were in 1914. We have also diverted from the creative and productive side of industry the useless excess of people that the community is now supporting in distribution.

The Federal Trade Commissions report brings out strongly the following facts:

1. The consumers cost of living is kept too high because of the too wide difference between retail prices and manufacturing costs.

2. The so-called open price associations and uniform cost accounting associations have resulted in excessively high selling prices by manufacturers.

3. Court injunctions prohibiting the trade commission from investigating or publishing actual cost figures.

4. Today's prices even by the producer of such basis commodities as coal, steel, lumber and building materials are artificially maintained at an exorbitantly high level and beyond the purchasing power of the consumer resulting in a small volume of business activity.

5. The existence of typical cooperate monopolies in defiance of the Sherman Act.

6. Interference with channels of trade by distributors trade associations tending to maintain an unnecessary number of inefficient so-called "regular" dealers while shutting out dealers seeking to sell at lower prices and especially co-operative purchasing and distributing organizations.

Each and every one of the foregoing factors which the Federal Trade Commission state are responsible for present day high cost of living, national under-consumption and business depression are due to a lack of conception of their responsibilities by executives, legislators or judges and due to a lack of understanding of fundamental economic facts and factors by these same executives.

How are we to train our executives so that they will understand that business success depends on a recognition of the rights of the individual and the community and that any business that seeks profit by especial privilege or by fictitious restraint of trade will gather but a temporary harvest of exorbitant profit to be followed by disaster not only to that business, but even to the nation?

Let us first ask ourselves where and how executives are trained today. Most of them attend some college or University, taking either an academic, business, or technical course. How can college studies influence the future executive so as to develop real leadership and an appreciation of his responsibilities to the community?

The college student is influenced most by the teachers of his favorite courses. If it happens that among his favorite studies are economics, sociology, or ethics, he is likely to get some fundamental principles underlying leadership. If, however, his course is technical he is likely to give a minimum of thought to those studies. How important, therefore that our technical instructors should themselves do their teaching in such a way as to develop a knowledge of the economic, social and ethical phases of technical studies and to develop leadership in their studies and to develop leadership in their students.

This development of leadership involves first a knowledge of what are executive and leadership qualities, and how to develop these qualities.

It involves secondly, a knowledge of instincts, desires and powers of men, and of how to apply leadership qualities in utilizing these instincts, desires and powers to get results. But the possession of executive and leadership powers without sound economic and ethical ideals and without a profound sense of the executive's obligation to society, viz. to the community and to the individual worker and consumer in the community is only an incomplete and dangerous power.

But we cannot hope to do much toward developing an appreciation of the executive's community responsibilities in undergraduate education. The undergraduate student may remember that on the 10th of July of 1789 the Bastille was stormed—yet he is less likely to remember that the cause of this eruption was not so much political as it was economic—that low wages, coupled with high costs of living and high taxes had lessened the consuming and producing capacity of the community and that wealth had been concentrating instead of diffusing and as a result there was an upheaval. The undergraduate student is too immature and too inexperienced to gain much from such studies as have been advocated.

The really big opportunity for training lies in extension education for the adult executive. There is abundant opportunity for the offering of such extension education by lectures, intensive short summer courses, or by correspondence courses, and business and industrial executives will join study groups in the branches indicated with very little persuasion.

If every college and university in the land, every society such as the S. I. E., every state and Federal Bureau of Education, and such institutions as the Y. M. C. A. and the private correspondence and extension schools and universities were to offer such courses, they would all find ready students and the result would be a speedy return to the economic and political ideals of their forefathers and a return to prosperity and genuine Americanism.

We cannot have too many agencies engaged in the extension training of existing executives. The Society of Industrial Engineers should encourage, foster and promote such extension training and also undergraduate training to develop executive and leadership qualities. The Society should maintain a permanent committee on executive training. This committee should make a survey of existing undergraduate, graduate and extension methods, policies and ideals in executive training and should publish printed reports annually, setting forth the results of such surveys together with recommendations. Such surveys and reports will be welcomed by educational institutions, and the more progressive commercial

and industrial associations who will encourage their individual members to make use of the reports and follow the recommendations made.

THE CHAIRMAN: I am sure we appreciate the courtesy of Professor Larson in reading this paper. I know I am imposing on a man to ask him to do this at the last minute, but I received these copies just as I came in the door.

As you came in the door there were given to you copies of Professor Bliss' paper on Existing Courses in Management Engineering and also a questionnaire which I hope you will fill out, and if there are any additions as mentioned on the questionnaire, that you will write those additions on the back and hand them to some one at the door as you go out or leave them in your seats.

We want to get as large an expression of opinion as possible and I may say that if you have anything that you wish to add after you leave the hall I would be glad to receive it at any time and incorporate it.

At the close of the regular addresses, I hope to have an open discussion and I trust that you will be priming yourselves to take part in that discussion so that we may arrive at something tangible, if possible.

I think we can now proceed, with the second half of our program—"The Best Way to Develop these Qualities". I am going to call upon Professor John. J. Flather of the University of Minnesota, who like a number of us has spent considerable time in the shops and factories before he went into the teaching profession in order to see two sides of the question. Professor Flather will speak to us on "Industrial Leadership and its Development".

PROFESSOR JOHN J. FLATHER (University of Minnesota): I have changed the topic somewhat in order to have a background so that we can see exactly the relation that the scholastic work will bear to the general problem before us. I shall, therefore, speak on Industrial Leadership and its Development.

It has been gratifying during the sessions of these meetings to find the general unanimity of opinion on principles as enunciated by the men practically engaged in industrial management work and among the educators.

"INDUSTRIAL LEADERSHIP AND ITS DEVELOPMENT"

JOHN J. FLATHER

Professor of Mechanical Engineering, University of Minnesota

The present day demands made upon our engineering graduates impose upon the universities the task of providing liberal curricula so that every man may obtain that preparation which will best enable him to serve his day and generation in whatever field of activity he may chose to

enter—not merely as a successful engineer or executive but as a cultured citizen.

Before engineering education was introduced our colleges were preparing men for the learned professions—law, theology and medicine and in those days Latin, Greek, Mathematics and the Humanities constituted the principal subjects taught, although such sciences as Physics, Chemistry, Geology and Botany received a fair share of attention. When it was recognized that an engineer might become a better engineer if his education were directed toward those subjects which are more closely related to his vocation, these sciences together with Mathematics formed a nucleus around which engineering education developed. The forces and phenomena of nature received considerable attention and the past achievements of mankind were made manifest by studies in history and literature.

By means of mechanics and graphics **forces** became real and were vitalized.

In the second stage of the development of engineering education, the study of materials was added to that of forces which led up to the design of machines and static structures and to the consideration of the construction and economic operation of machines. In this stage which has been progressing during the present generation, there has been a remarkable increase in the scope and number of subjects which the engineer must study and know something about. While engineering education has been segregated into a great variety of divisions embracing Civil, Mechanical, Electrical, Mining, Metallurgical, Chemical, Agricultural and other main divisions, there is a certain amount of work which is recognized as common to all. In addition there are also some subjects which are common to certain fields as for instance hydraulics which is common to Civil, Mechanical and Electrical Engineering. Transportation is also common to these three major divisions. It is further recognized that certain studies in electrical science are required in most of the various divisions of engineering.

At the conference on Business Training for Engineers held in Washington a year or more ago, Gen. Black, Chief of Engineers, said: "We know that for subordinate positions we can use a man who knows only one thing, and he is a very valuable man, but he is strictly subordinate and must be so all his life, for he knows only that one thing. He never can rise to the top". Educators have recognized this for many years and the curricula of our engineering schools are based on a broad foundation rather than intensive.

While we think of the Civil Engineer as one who is engaged primarily in the work of transportation, sanitation, municipal and structural engineering, it is also recognized that his ground work should cover some knowledge of heat engines and machine design.

So also with the Electrical Engineer. In addition to his purely electrical studies, he must know something about stresses and surveying, gas engines and steam turbines, and as an improvement on the ancient Israelites who made bricks without straw, the electrical engineer must be taught how to bring into existence systems of communication that reach across vast continents without physical materials of any kind.

The Mechanical Engineer likewise must become familiar with stresses and metallography, surveying and concrete, hydraulics and turbines, as well as dynamos and motors and their applications in the industries.

All of these have received attention during the past 25 years and the world applauds the wonderful developments made by the engineer in advancing civilization.

During the recent Great War the achievements of the engineer brought him into prominence, and his success as a leader in all lines of industry and in administration was most notable.

The various engineering instrumentalities by which the war was fought and won and the prompt and effective manner in which the engineer solved the many problems that were presented to him have compelled a recognition of the importance of engineering training never before acknowledged. The character of the instruction received in the scientific and engineering departments of our schools and universities; the mathematical applications; the methodical laboratory reports; the curves and diagrams which so clearly express results; and the conclusions drawn from the data: this is the sort of training that permits a logical analysis of the problem, makes for clear thinking, and is conducive to exact expression. Under such influences, analytical methods become a state of mind and immediately suggest a solution, be it the feeding of a starving nation by a Hoover, or the building of a Panama canal by a Goethals.

Notwithstanding the efforts which have been made to prepare the engineer for all possible fields where his ability and training are needed, very little attention has been given to that most important factor which must be reckoned with in all industry, namely, the human element. And yet two hundred years ago Alexander Pope with far seeing vision pointed out to us that "The proper study of mankind is man". If the engineer is to attain the greatest measure of success in the future we must recognize his relation in the general scheme of industry and study men. We are now therefore entering upon a third stage in the education and development of the engineer which will take into account the relation of the employee to industry. As my old friend Breckenridge has so tersely pointed out:

First we studied forces and the natural sciences, then materials were

added and machines were studied; now to all of these we must add the study of man.

Millions of dollars have been spent in improving the performance of our engines and machinery in the various industries of the country, and in perfecting the output of our factories; but until quite recently little attention has been paid to the betterment and performance of the men who operate the machinery and manufacture the product.

In former days little attention was paid to the economic problems in engineering; Industrial Management, Business Organization, Labor Problems, Finance, Psychology, Sociology: these were not even thought of in connection with engineering education 30 years ago but now that it is being recognized that the engineer must play a large part in the solution of civic and social problems and in those reorganizations and adjustments in industry which must be brought about between capital and labor, he must have training in these subjects. Moreover the engineer by virtue of his connection with capital and labor must function closely with both, and the human element in these industrial relations is an economic and social force which demands and must receive consideration in any broadly conceived scheme of study in order that the engineer may function properly.

The real interests of both capital and labor are not antagonistic, they are mutual. The material prosperity of the employer can only be brought about by an increased prosperity and a betterment of the physical and social conditions surrounding the worker.

Labor welcomes the inspiration of trained leadership and looks favorably upon the engineer whose efforts are directed to the amelioration of the conditions of the employee; but before the fullest cooperation can be established between the management and labor, the latter must be brought to an appreciation of the fundamental truths and principles which underlie all economic problems. Herein is a great opportunity for the industrial engineer as well as the educator. In bringing about a closer relation between employer and employee, with better working conditions and larger productivity the engineer renders a service to capital as well as to labor and to the public.

In considering the means for promoting that leadership which will bring about these adjustments and betterments in industry it may be pertinent to ask what are the most important characteristics of industrial leadership; what effect will these have in any organization; and how may they be developed?

The job specifications applied to an executive vary with the job to be performed but there are certain qualifications for leadership which are

generally accepted as essential to success. The relative value allotted to these qualities are influenced largely by the point of view. Thus one man thinks good health is the chief qualification for success in leadership while another thinks character is the one essential; while a third demands practical experience as the *sine qua non*.

Skill does not necessarily accompany those qualities of leadership which are essential to success, even in the lower positions where responsibility is involved—a good workman is often a poor foreman.

We should distinguish between the qualifications for success and those for leadership. A man may be a good designing engineer and achieve success as such but he might fail as an executive and leader; or he may be a genius who readily solves the intricate problems with mathematical physics, but if he lack understanding of men he will fail as an executive.

Probably the most important qualification required for leadership is character,—that quality which Hamilton Mabie says “is the determination to do right turned into a fixed habit”.

Mr. G. S. Lee in his book on “Inspired Millionaires”, states: “The more successful and prominent business men propose to be, the more they are driven into doing right”. So with the successful industrial leader: To succeed he must persist in doing right. As one who functions between Capital and Labor he must see that both parties have a square deal—and this simply because it is right. The policies of the demagogue are no longer tolerated and successful industrial leaders have found this out. Men will follow fair minded inspiring leaders but they will not co-operate with an autocratic boss. They understand what Pope has so well said: “Worth makes the man, the want of it the fellow”.

Opportunity for developing character lies at everyone's door. Herein lies the great opportunity of the educator—to build character,—to make men who can always be relied upon to do right. We have been training men for technical positions: Have we been training them for leadership by developing character? When we realize more fully the human element in engineering education, the importance of character building will be recognized as on a parity with that of the technical training. Fortunately it can be promoted coincidently with technical training if we recognize that the contagion of example is a powerful force in developing character.

The great teachers of the past, such as Arnold of Rugby, endeared themselves to a whole nation not so much by the Latin and Greek or Euclid taught in their schools, as by the character which by example and precept was instilled into, and became a part of every boy's life.

Another important element which affects the success of a leader is Disposition. We think of a man with a sunny, cheerful disposition, or with a sour, crabbed disposition as though he were born cheerful or crabbed. If cheerful, he is to be congratulated in having cheerful parents; if crabbed he receives our sympathy but no one loves a grouch. Is it not possible to cultivate a cheerful attitude and become an optimist? If the charm of a cheerful disposition wins friends and followers and is such a valuable asset in leadership, is it not worth while to try to develop cheerfulness? I do not mean that one should go around grinning all the time like a Cheshire cat, but rather that he should be a cheerful optimist, not an iconoclastic pessimist. The former sees the beauty of the rose and enjoys its fragrance; whereas the latter beholds only the thorns.

Optimism leads to achievement. The successful leader, while he sees both sides of a problem, magnifies the best in every situation and meets it cheerfully instilling hope and enthusiasm in all with whom he comes in contact. Cheerfulness like a good lubricating oil in machinery smooths out many difficulties and reduces the friction of daily life. Cynical, pessimistic, sour faced men are not wanted as leaders. On the other hand the cheerful, confident man who carries a smile about with him inspires confidence in others; he thus gains the good-will of his associates and obtains their co-operation. This attitude of mind can be cultivated and easily passed on to others, and soon it too becomes a habit.

A successful atmosphere makes for successful leadership. If one's mind is full of confidence in one's ability to accomplish a certain result, achievement will surely follow. Not the over-confidence of the shallow braggadocio which can only lead to failure: but rather the quiet thoughtful confidence which comes from a realizing sense of one's ability to achieve—a confidence based on past achievement which stimulates mental activity and develops courage and power.

The successful leader is one who has confidence in others. He harbors no unkindly thoughts and is charitable even magnanimous in overlooking the faults of others. There will come a time when firmness must prevail but the daily mental attitude should be one of goodwill and helpfulness. An executive who thus keeps his mind attuned will obtain the support and goodwill of his associates who are thereby inspired to put forth their best efforts, and results will be secured that, without the goodwill, would have been impossible. Men will do wonders for an inspiring leader whom they respect, but very little for a driver or tyrant. The day is past when such men are wanted even in the foundry.

Leadership demands imagination, clear vision—ability to see thru to the end. A leader must possess the creative function and think things out

for himself. Men without imagination become mentally ossified and after 40 years of age are mere producers and followers—never leaders. They work hard but are mere plodders trying to keep alive but are actually dead as far as progress is concerned. These are the men whom Osler had in mind.

The splendid outstanding triumphs of science and engineering are the results of the imagination of some intrepid leader, which stimulates others to action. The virile man who has imagination so that he can project himself into the other fellow's place and see the other's point of view has perspective, and this gives balance to leadership.

The successful industrial leader recognizes the effectiveness of a well planned organization and is always on the lookout for desirable men who may be developed from the present employees to occupy positions of responsibility higher up. He has little faith in the limitations of a man due to circumstance and environment, and would rather stimulate ability by imposing new duties and responsibilities on men who have made good in their present positions, than to take in a new man from outside the works. This policy of rewarding the worker provokes greater effort on the part of the workers and eventually builds up an effective organization which works in perfect harmony like a well regulated, well lubricated mechanism. But the successful leader should not confine his promotions entirely to men from within. Sometimes an organization lacks a man who is qualified to fill a given position and a man of unquestioned merit is found outside. By bringing in such a man the whole organization may be benefitted.

Leadership assumes and must have responsibility. Without responsibility one of the principal incentives to best effort is lacking. Men with vision and imagination who are not allowed to plan nor to put into execution the active creations of their minds are not responsible, therefore they are not in a position to enjoy the benefits achieved. Without responsibility even the best men lose interest and inspiring leadership is thwarted.

Carnegie was great because he thrust responsibility upon men and made great captains of industry.

A man who talks of his hard luck and lack of opportunity always will lack opportunity. Such men never will become leaders because they lack, not opportunity, but will power. Leadership involves fundamentally the recognition by the individual of his ability to do things—the assertion of this thought in a masterful way causes others to recognize leadership.

Initiative is the product of imagination and is closely associated with responsibility. The man who thinks he never had a chance will never exercise initiative nor responsibility even tho an opportunity should

present itself. He waits to be told what to do, and so long as he waits he never will rise to leadership.

He who would serve in a responsible position must first assume responsibilities.

The successful industrial leader is one who must be interested in his job; the job is the big thing—not the salary which goes with it; if he takes care of his job properly the salary will follow. Such a leader is one who has ambition, energy and enthusiasm and can stimulate ambition in others. Few men there be who like Diogenes are content to live in a tub. Somewhere every man who has not entirely lost his grip possesses a spark of ambition which merely needs proper conditions and stimulation to burn steadily.

Encouragement by recognition of present effort and stimulation to still higher achievement is a means of promoting leadership whether applied in the factory or halls of learning. Many a turning point in one's career may be traced to the kindly, inspiring word spoken to the discouraged worker at a critical moment. And many a man has gone forward to success because of the needed stimulation which aroused his ambition.

Among other qualifications for leadership thoroughness should be accorded a prominent place. In acquiring thoroughness a man establishes habits of accuracy and industry which when associated with other elements of leadership make for success.

If he be well trained in fundamental scientific laws the man with imagination will not be constrained to follow existing conditions and methods: he will originate where others are content to follow. Like the skillful navigator who sails the uncharted seas relying confidently upon sextant and compass, he launches out into the unknown and makes discoveries or introduces methods which contribute to the world's advancement. A mastery of basic scientific laws gives a man confidence which enables him to boldly lead, and right here is where thoroughness in the acquisition of fundamental principles is essential to leadership. He may not be a leader even though he have a sound conception of fundamental principles which underlie his profession, but without them it is the rare man who rises above mediocrity.

In a recent census covering about 400 distinguished engineering graduates from various technical schools nearly 50 percent were in the highest fifth in scholarship in their respective colleges; whereas less than four percent were in the lowest fifth.

To say that any one characteristic of leadership is the most important is like stating that one leg of a three-legged stool is more important than

the others; and yet if we were to select one dominating qualification which is prerequisite to promotion for most men and which is outstanding in its influence-like character it would be a thorough knowledge of the fundamentals of one's profession and a fair degree of skill in their application.

Even in business and fiduciary relations a man connected with the industries who is well grounded in the fundamental scientific principles which relate to the industry has a decided advantage over his fellow who lacks this knowledge, provided he possess the other qualifications for leadership to an equal extent—although it must be admitted that in certain positions of trust and responsibility relating to the industries other characteristics such as judgment, firmness, character and sympathetic understanding of the human element are important qualifications which have allowed men to become successful leaders without the special knowledge of fundamental principles, or even of the practice, relating to the industry.

Experience and judgment are contributory factors of great value—not only personal experience but the experiences of others which may be acquired from books and association. Experience whether personal or acquired from other sources forms the basis of judgment and when augmented by analytical methods of reasoning based on sound theory a man's judgment, if free from personal bias, will become more and more dependable as the years pass. A man of sound judgment is not one who merely uses common sense in his dealings. Common sense has its limitations but judgment based on sound principles is the very essence of engineering which far transcends contemporary practice.

The methods of present day engineering education are instrumentalities which offer opportunities for acquiring many of those characteristics which are essential for successful leadership but in order to meet the requirements of the industrial leader these courses must be supplemented by others which relate more particularly to the human element in engineering.

Contributing factors which have a strong influence in the training for industrial leadership are those which relate to student activities both in the field and forum. Men should be encouraged to participate, at least to a moderate extent, in athletics where prowess and the desire to excel are stimulating. They should be urged to join the local student engineering and debating societies, or other organizations, and become interested in their activities. These should not be one-man affairs, but rather they should be so constituted and managed by the students themselves that large numbers of men may have an opportunity to function on committees of various sorts. This will bring out latent ability and will be an aid in helping a man find himself.

Placing responsibility upon the student in the class room and laboratory is also a needful stimulus. The boy must learn to think for himself if he would be selfreliant, and the experienced teacher will bring out latent abilities in the student which will inspire confidence in the exercise of his own judgment.

He would be a courageous man indeed who would offer any general solution of our industrial relations problems but there are many contributing agencies which serve to promote a betterment in industry that will react beneficially upon capital, labor and the public. 'Our engineers, as industrial leaders, must become familiar with those agencies and this is possible through judicious courses of study supplemented when feasible by personal investigation. Some agencies which have been exploited' are sound in principle and can be adopted in many situations with satisfactory results; others are unsound and their application will result only in disaster, therefore the engineer must study the past, he must know the history of industry and those efforts and chimerical schemes which have been abortive. This applies to the engineer in practice as well as to the young engineer who is preparing to take his position in the various industries of the country.

He must study sanitation and provide clean, well lighted properly heated and ventilated factories which must be kept clean; he must study those social agencies which will interest the worker outside of his working hours so that he may be able to assist the employees in organizing clubs and societies for improvement and social recreation: He will soon come to understand that this must be done by suggestion rather than control because he will learn that workmen do not favor paternalism, and that in various ways he will be able to increase the material comforts of the worker and those lasting satisfactions of life which come from a well spent leisure. He will learn that philanthropy has no part whatever in industrial management, and that the welfare of the individual enters as a function of any well organized system only in so far as it may promote increased betterment of worker and employer. He will realize that safety and a sound mind in a sound body exercise an important influence in preventing a rapid turnover. By interesting the men in their own problems of safety, another tie is formed. By various means he will come to understand that the individual worker can be educated to a high degree of responsibility in connection with the introduction and use of safety devices, but what is of greater importance is the training of the workers to realize that a potential danger is constantly at hand. The direction of this work is one phase of engineering education which may be taught in our schools.

Other problems of industrial leadership that may be taught in the

colleges are those relating to employment, which should not be undertaken by a department foreman who "hires" and "fires" nor by an employment clerk who is unskilled in the various departments of an industry; they demand the best efforts of a broadly trained specialist who is competent to put into effect and carry out a well developed system based on the particular requirements of a given industry and on a sound knowledge and interpretation of psychological science in so far as this can be applied.

The problems concerned with employment are not merely finding a job for a man out of work; rather it is the selection of a man with physical fitness and with given inclination, qualifications and aptitude for a certain kind of work which is to be done. It is the selection of a square man to fill a square hole and a round man to fit a round hole. Such selection should carry with it the necessary training for the highest type of work which the individual is capable of performing. The selection and training of such men for specific duties constitutes an important part of industrial management that is already receiving considerable attention not only in the various industries but in our colleges as well.

The planning of the work and the determination of that unit time which makes for maximum production and maximum wage with least tiring effort are problems which must be solved by the management and in these the human element looms large.

The problems of employment are really secondary to those of unemployment which has heretofore received little attention on the part of the management. Civic and industrial responsibility must be emphasized. There is an obligation on the part of the management to keep the wheels of industry in motion during times of stress and we must look to the engineer of the future to make use of those potential agencies which will minimize unemployment and the economic waste resulting therefrom. The problems of unemployment, indeed those of employment also, are intimately associated with those of distribution, and this field offers great opportunities for research and development in the industries as well as in the college.

The possibilities of co-operative unemployment insurance, the expense of which is shared by employer and employee, offer a ready means to stabilize the workmen's resources at those times when unpreventable fluctuations of an industry exist.

The prevention of unemployment is an industrial problem which today challenges the attention of the foremost minds in the country. It is important for all elements of society that employment be regularized so as to minimize the periods of depression, and it is equally important that all classes—Capital, Labor, Management and the Public—be educated to

their several responsibilities and obligations in connection with this great problem. Special studies and investigations in this field are well worth while in the specialized training for industrial leadership.

Insurance of the employees in any given industry; exchange employment in seasonal occupations; best hours of labor in a particular trade or industry; proper output with a given organization; recognition of the principle that increased pay should go with increased production, and greater wage with greater skill: These are some of the outstanding problems which demand and must receive thoughtful attention from industrial leaders be they engineers or economists. In fact the industrial engineer who will most satisfactorily solve, and bring both capital and labor into a helpful appreciation of these problems, must himself be an economist. Recognizing these requirements the engineer of the future who would be an industrial leader must be so trained that he will have a correct perspective of his relations to Capital, to Labor and to the Public. Under these conditions he who perceives the human element in engineering will best be able to render service to his fellowmen; but let it not be overlooked that good results can only be achieved when the employer recognizes his responsibility and the employee his obligation.

THE CHAIRMAN: I am sure we appreciate your able paper and the addition that it will make on the subject of Industrial Education.

Professor Flather has mentioned three things which it seems wise for us to consider for a moment—**materials, machines and men**, with the last of which the industrial engineer is coming more and more into contact and, hence we should add also, **management**, which refers principally to the management of men. We are looking to the day when the industrial engineer will have something more to do with **money**; when he will be consulted regarding things financial; then he will come into his own. We may also add the consideration of the topic, **markets**. This has not yet been developed very fully in the realm of industrial engineering.

I am glad, also, that Professor Flather indicated another point, that is that the leader should make an art of his vocation. I may say that the time must come when all men must emphasize the development of their work into an art, when we must think of Labor from every source and every activity as an art. When that time comes, I think we will get away from the great American habit of holding the dollar so close to our eyes that we cannot see the rest of the world.

The next speaker is Professor Arthur F. Payne, Chairman of the Department of Trade and Industrial Education of the University of Minnesota, who will speak to us on the "One Fundamental of an Executive".

“ONE FUNDAMENTAL OF AN EXECUTIVE”

PROFESSOR ARTHUR F. PAYNE

University of Minnesota

I am very glad I did not write my speech. If I had, I should have torn it up and thrown it away. The thought that I want to convey to you is something quite different from what I had intended, but I have heard so many very fine discussions on the qualities of an executive that it started my mind running along an entirely different line and I find that what I have to say will require one of the qualities which has been emphasized in an executive, and that is tact.

I am going to put up a new proposition from that which the previous speakers have put up, both today and yesterday, and I will have to be tactful about it.

I am reminded of the story of the big buck negro who found himself after the armistice in Cologne about to be sent out on guard duty. The sergeant in charge of the guard detail read the orders which were that they must treat the inhabitants with courtesy and tact. The big black buck said, “Sahgent, I understan’s what this cutsey am but I don’t understan what this heah tact am”.

The sergeant tried to tell what he meant by tact and got tangled up and finally tried to explain by illustration. He said, “Before the war I was a plumber in Savannah. I gets a hurry call to go to a house; the bathroom has sprung a leak. I grabs my tools, goes over the backyard fence, goes up the backyard stairs, rushes into the bathroom and theré I finds the lady of the house taking a bath. I backs out and says, ‘skuse me, skuse me’. That was cutsey, but when I closed the door I said, ‘skuse me, sah, skuse me sah’ and that was tact”.

I hope I can be as tactful as our black brother in what I want to say. I want to make a proposition to you on that basis: That it is not qualities that we are seeking for in an executive, but a quality—one thing upon which all the others rest.

I have made a list here from the previous speakers, Mr. Emerson, Mr. Miller, Mr. Stout and some of the others, and I have got up as high as nearly fifty qualities which an executive must have. I would like to have all of you who consider yourselves successful executives to hold up your hands.

(No hands were raised.)

Mr. Chairman I never realized that they were so modest. I was going

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to ask those of you who have the qualities I am going to read to hold up your hands. It sounds like the catagory St. Peter is going to read off to all of us when we try to pass the heavenly portals. These are the qualities:

Wholesome	Ideals
Clear-minded	Resourcefulness
Appreciative	Leadership
Manly	Be a student
Sympathetic	Tact
Just	Charm
Fair-minded	Broad Training
Broad-visioned	Fundamental training
Imaginative	Specialized training
Sane	Truthfulness
Diplomatic	Competent
A man	Have good health
Ability	Optimistic
Responsibility	Enthusiastic
Firmness	Cheerfulness
Integrity	Confidence
Honesty	Cooperation
Character	Virility
Capability	Balance
Foresight	Experience
Attractive Personality	Analytical reasoning
Loyalty	Knowledge
Commonsense	

It seems to me we have got to make an entirely different approach from what we have been doing. We have got to make one fine distinction between those qualities inherited and those qualities which may be acquired. That is one of the first distinctions that we have got to make. Another thing is this: We have got to make a choice between using the empirical method which as engineers and as scientists we have discarded except apparently in this one field, and the scientific, analytical method.

It is far from me to differ with such a man as Mr. Emerson, a man to whom we all bow, but he gives us as a quality necessary in an executive, character. What is character? Who is going to tell us about it? How do we know when a man has it? If he has not got it, how under the sun can we give it to him?

If you can answer those questions, gentlemen, you have settled the problems of the world, that is what you have done. He must be competent. Upon what one thing is competence based? I want to develop that with you. He must have courage. A man may be courageous in some things and he may be a coward in other things. Under certain circumstances he may be brave and yet show his yellow streak in other circumstances. Just what do we mean as scientists, as engineers, when we talk in such a loose fashion?

Finally, Mr. Emerson said that he must have charm. I never thought of charm before in connection with an engineer. I have thought of it in connection with engineers' stenographers, secretaries, wives, sisters and daughters, but never in connection with the engineer himself.

Let me go to the one thing I am here to tell you about, and that is this: That the one big thing an executive must have is that thing which your grand-daddy and my grand-daddy used to call "gumption" and then we advanced a little and said that he must have brains until we found out that he only had one brain, and then we found out that it did not make much difference how big his head was because the size of the brain was no indication of the functioning of the mind. Then we went further and said that he must have intelligence, and then finally, by the use of the scientific methods and scientific knowledge and the collecting of data we have got it to the point where we know what we are talking about in regard to intelligence and now we say he must have a high I. Q., or a high intelligence quotient and that is the thing I want to propose to you in the place of these fifty-seven varieties of all sorts of things.

I would like to suggest that you get in touch with the work of Committee Twenty-two of the American Association for the Promotion of Engineering Education which is conducting an experiment which will take ten years. The experiment is now in its third year. By cooperating with fifty engineering colleges, they are trying to find out how much intelligence an engineer must have—and I am using the terms engineer and executive somewhat interchangeably because everybody else but college professors have waked up to the fact that most of our engineering students develop into executives afterwards. We are still training machine designers who go out and do a little designing, but they become business and industrial executives. I say that because I am a college professor myself.

These charts which I have here are simply the result of some work that was done by the Committee on the Classification of Personnel in the Army and I am presenting them to you as an indication, not as a final proof nor as complete or perfect. They are not. We have information now which will result in changing some of these, particularly this one

headed "Spread of Middle fifty per cent, etc". I want to present these as partial proof for the one point and that is that the one thing essential is native intelligence, the thing with which you were born, as distinguished from education, the inherited thing as against the acquired thing—thinking of the inherited thing as the inherited intelligence, native intelligence, and the acquired as that thing which you can acquire by means of education.

This is all in terms of the army and the army's needs, but I want to propose to you that the method does not differ one single bit.

Here, for instance, we have the data on success and failures in officers' training schools. I want to maintain that the officer in the army was an executive and he required all of the characteristics, whatever they may be, of an executive in industry.

Let us see what we have. First of all I must tell you how these rankings were obtained. You have all heard about the intelligence tests in the army. Alpha for those who can read and write the English language and this (indicating) for illiterates—foreign people. Here they used the Alpha test. They discovered in that group of officers who made the rank of "A", the highest possible ranking, that this per cent succeeded and this per cent failed. (indicating) Of those who made "B", this per cent succeeded and this per cent failed—C-plus and so on and C-minus and D.

I want to put this proposition to you straight: Isn't that the one thing that determines probable success in an executive position, and isn't that the one fundamental essential qualification which an executive must have?

Furthermore, we have here in the various kinds of intelligence tests, a means for measuring the possession or non-possession and the degree of possession of that one fundamental qualification. For instance, we can say to a man, "You will not make a good executive or a good officer in the army unless you have at least a grade of C in the intelligence test, and even then you will only have a fifty-fifty chance of success as shown by this chart.

We have a wide variety of standard tests. I am quite well aware of the fact that a good many manufacturers, business men and industrial executives, look upon the new science of psychology as something either very wonderful or else something very ridiculous, but the time has come, gentlemen, when we as industrial engineers have got to recognize impartially and without prejudice the work of the psychologists in this new science, and when I speak of psychology I do not mean at all this pseudo character analysis which, of course, is something so preposterous that no sensible man would have anything at all to do with it.

Let me give you a further proof about the necessity of this level of intelligence. Here we have figures on this number of illiterate foreign

whites, the solid black line. Notice how they bank over D—a low rating, a very low rating. Then we have the literate whites, those that read and write. They begin to come up and they bank over C. Here are the sergeants and corporals, beginning to get to the executive positions. See how much intelligence they have to have to get by. Here they bank over C-plus and B. Mind you, none of this thing I am telling you about here is one hundred per cent perfect, not at all. We have some sergeants on E and D who failed, the same as we had some illiterate and foreign whites who made A, but we can claim about ninety per cent for this proposition.

In the commissioned officers here we come to our real executives. None of them made below B and the majority of them ranked up over B and A.

The Committee chose the Yale freshmen because of the fact that the entrance examinations at Yale University are probably more difficult to pass than any other entrance examinations we have and, therefore, the Yale freshman must have a higher degree of intelligence. See how they ranked on this. None of them made below C-plus and they all piled right up over the A, the highest possible score.

If I have made that proposition clear to you and perhaps convinced some of you, let me move to the next proposition which is entirely outside of the field of the essential qualifications of an executive: The use of this knowledge, these levels of intelligence and these methods of measuring intelligence to settle the problems of industrial unrest and training and getting the right man, the one best man on the job. Using one of Taylor's four B's, there is a best man for that position. Here, for instance, are the mental ratings and the occupations of nearly forty thousand men classified. This chart shows the spread of a middle fifty per cent medium scores for various occupational groups. The highest possible score was two hundred. Notice what happens.

We have semi-skilled laborers, skilled laborers, clerical men, business and professional men and here on the bottom part of this chart you have a summary of the whole group. In other words, laborers only have to have that much intelligence, (indicating) semi-skilled laborers this much and they make this score on the intelligence test. The skilled laborers make this much and the clerical, business and professional men that much.

We have got to the point where we can say to the engineering students, "You must pass or you must make a certain score in an intelligence test or otherwise you will probably fail as an engineer. You will probably fail as an engineering student". You might say that this is something new and radical but it is not. We have been doing it all along before we knew anything of this kind of thing. Our public school system, universities

and high schools are nothing more or less than the elimination of the unfit on the basis of intelligence.

We used to say boys and girls left school because of the fact that they disliked school and then we could not quite stand that because it hurt our feelings a little as teachers so we searched around for another reason and found that they left school because of economic pressure, their families needed money. The United States Bureau of Education made a survey and took that prop away from us and now we have come to this conclusion: That they leave school because they are failing in their studies and they fail in their studies because they lack the intelligence to do the work. That is the explanation of the great exodus from our high schools and from our colleges and particularly from our engineering colleges.

Another application that I want to present to you is this: That the great part of our industrial unrest is because of the fact that we as employers, as engineers, do not use scientific methods in getting the right man on the right job. In fact, we have been everything in the world but scientific. Let me put this proposition to you: We have a job here and we make job specifications for that job, but so far we have neglected to make job specifications in terms of personnel for that job. We have got to make accurate specifications for the best person for that job. Let me give it to you this way: Here is the job. We know that job requires a certain amount of intelligence to be successful and I do not care what it is, whether it is a general manager of a railroad or whether it is a bootblack, it is possible to establish the level of intelligence necessary for success on that job.

If you get a person on that job with intelligence too high or higher than necessary for success, they won't stay with you long, they will get sick of your job. If you bring economic necessity to bear upon them, they are going to develop into a common grouch and find fault with everything and develop into Bolsheviki. If you get a person on that job with intelligence that is too low for success on that job, they are going to spend an inordinate amount of effort producing mediocre work and you are going to come around and say, "Here, this work you are doing is not good enough and you have not done anywhere near enough of it", and then they are going to work harder and harder and work themselves into mental and physical exhaustion and say, "You are nothing but a slave driver, grinding your help down and damn you, any way". That is where we get our reds and radicals and all of our other people. The thing for us to do as scientists, as engineers, is to establish the mental level necessary for success on the job and use the means we already have at our command and pick out the person with the intelligence just necessary to do that work.

A few weeks ago I was in the East and a man came to see me that I had helped in various ways during the past four or five years. He said that he was having a hard time with his help. He said, "I always do the best I can by my help," and he does. I said, "What are you doing to get the men?" He said, "I get the best possible man that I can to take that job and then hang it all, in a month he is quitting me and will not stay. I said, "That is where you make your mistake. Don't get the best man that you can get to take the job because it may mean that you have a man who is far superior to the needs of that job". How many of you men would take a job sticking labels on pickle bottles and be happy and contented? You would not stay there and that is all there is to it. He had been trying to get the best possible man for a mediocre job. The man would get on the job and even though he raised his pay he would not stay. He said "I won't work under those conditions; there is nothing to it for me. Good Bye". You can't talk to him. That is an error. Many times we have made the same error at the other end of the scale which is getting a person with too low an intelligence on a certain job and they cannot do the work and we get discouraged and fire them.

I think that I have delivered my message. I hope that I have been at least as tactful as our big black brother over in Germany when he told the bath-tub story. (Applause)

THE CHAIRMAN: I am sure we thank Professor Payne for his very good address.

The next paper was to have been given by Professor Collins P. Bliss, Head of the Department of Mechanical Engineering, New York University. Copies of his paper are in your hands and the paper will be read by Professor Howell McL. Gano of the University of Cincinnati.

PROFESSOR HOWELL McL. GANO (Cincinnati): One of the speakers last night said that he had spent some hours in writing up his talk and had notes on it with him and when he got to the meeting and went to make the talk he could not read the notes. My book is in a little different shape. I did not write this paper but I have to read it. I am sorry that Professor Bliss is not here because he would do much greater justice to it than I can. The only thing I know about the paper are the tables and the curves in the back.

“EXISTING COURSES IN INDUSTRIAL ENGINEERING”

COLLINS P. BLISS

Head of Department of Mechanical Engineering,
New York University

Calvin Coolidge, when Governor of Massachusetts, once said—

“Our prosperity comes from our industry and our industry cannot flourish unless it is directed with the highest intelligence. Far more in the future than in the past will this intelligence call for sound training in science and in its innumerable applications to industry.”

Many manufacturers admit their inability to get properly trained men to carry out the details of executive planning and of production.

Those things which most of our technical schools are able to cover in four years are purely the essential fundamentals of the usual courses in Civil, Mechanical, Electrical and Chemical Engineering. In fact the basic training today in all types of technical courses is either civil or mechanical. In the early days of engineering the first courses instituted were designated as “Civilian” engineering in contra-distinction to “Military” engineering. Now the cry is heard on every side for that type of training which will furnish men skilled in the art of using that which the civil or mechanical engineer has built, and that in a manner to produce the greatest results at the least cost. For the lack of a better name we are calling it “Industrial Engineering.” To meet an industrial awakening not far distant in this country and but a little further remote all over the world, it is within the province of the educators of this country and it is their opportunity to rise to this emergency by preparing for the market that which the market demands and not quite so much of that dictated by pedagogic precedent.

There is probably no institution of higher learning at the present time that has not revised its technical curriculum as a result of the lessons learned from the intensive training called for by the Government from those colleges which turned over their facilities during the war for this purpose.

The invasion of an army of men from the industrial walks of life, the everlasting production of those four years of supremacy of essential industries and above all the indisputable fact that “trained”

men were the only men wanted have all worked together to show the schools and colleges of engineering that more can be done in less time, while greater co-operation with those that produce is at least one of the "signs of the times" likely to be displayed for the next decade.

THE INDUSTRIAL ENGINEER

"Industrial Engineering" seems to be the title most generally adopted to designate those courses which endeavor to train men for constructing, operating and managing that which the professional engineer has designed. Other captions such as "Administrative Engineering," "Business and Engineering," "Engineering Administration," "Executive Engineering," all seem to lead in the direction of substituting for the more highly specialized technical subjects those that might be generally termed "Economic." The kind of graduate such courses are planned to produce is one who shall possess the qualifications of an executive trained for engineering rather than for business, that is, in terms of a definition promulgated by the Educational Committee of The Society of Industrial Engineers, "The training of the Industrial Engineer should fit him to direct and control as an executive all of the agencies and forces of productivity."

To quote from a paper read before a recent meeting of the Society for the Promotion of Engineering Education, by Professor W. H. Timbie of the Massachusetts Institute of Technology—

"It is these men who in the last analysis must direct the operation of the nation's industries. For our industries cannot compete with those of other countries unless they are conducted by men who have large vision, intimate knowledge of manufacturing details, and a thorough training in science and scientific methods. Manufacturing must be conducted on a sound financial basis, which means that processes of production must be so managed that the total cost of the finished article will be low enough to compete with the products of foreign factories. For this task the services of an engineer who has a thorough knowledge of manufacturing processes are invaluable and his duties multifarious. He must not only be familiar with the best methods of production, but he must thoroughly understand scientific research, in order that he may take advantage of new discoveries and continually better his methods of production."

CO-OPERATIVE WORK

A new feature recognized by nearly all institutions offering these newer courses is some plan of co-operative work by direct

contact with industrial plants. Those which have not adopted a definite co-operative plan, require students to spend four or eight weeks during each summer acquiring experience in those things which either cannot be taught in college through lack of time and facilities, or are peculiar only to manufacturing and industrial enterprises.

While most of the co-operative courses from the inaugural one in this country at the University of Cincinnati, followed by that at the University of Pittsburgh, to the most recent ones at Massachusetts Institute of Technology, the Harvard Engineering School and New York University are not confined to courses in Industrial Engineering only, they show a tendency of the time in making a part of all such courses some form of practical instruction to be obtained only in direct contact with industry itself. Whether the two weeks period of alternate work at the college and at the industry as introduced by Dean Schneider, or the three months interval at each between the end of Sophomore year and beginning of Senior year, as tested for ten years at the University of Pennsylvania is the best for final adoption by all, may still be open to argument.

Still another plan is in operation between the Massachusetts Institute of Technology and the Lynn Works of the General Electric Company where thirteen weeks are spent in the industry and eleven weeks at the institute alternately for the last three years of a five-year course in Electrical Engineering.

New York University has one of the newest plans confined solely to its course in Industrial Engineering where at the end of the Sophomore year the student spends half of his time for the remaining twenty-four months of his course at the Industry and half at the University in alternate periods of four months each, the longest term yet attempted under the co-operative plan. A fifth year is spent in elementary research or in the investigation of industrial problems either at the University or at the Industry or partly at both. The usual B. S. degree is given at the completion of the four-year term and the degree of I. E. at the end of the fifth year year under the above arrangement.

Under each of these methods of introducing the student to the great field outside of the college walls, whether his contact is worth more by reason of a short interval or a long one, the fact remains that his education is broadened and his ability to think and act for himself enormously increased.

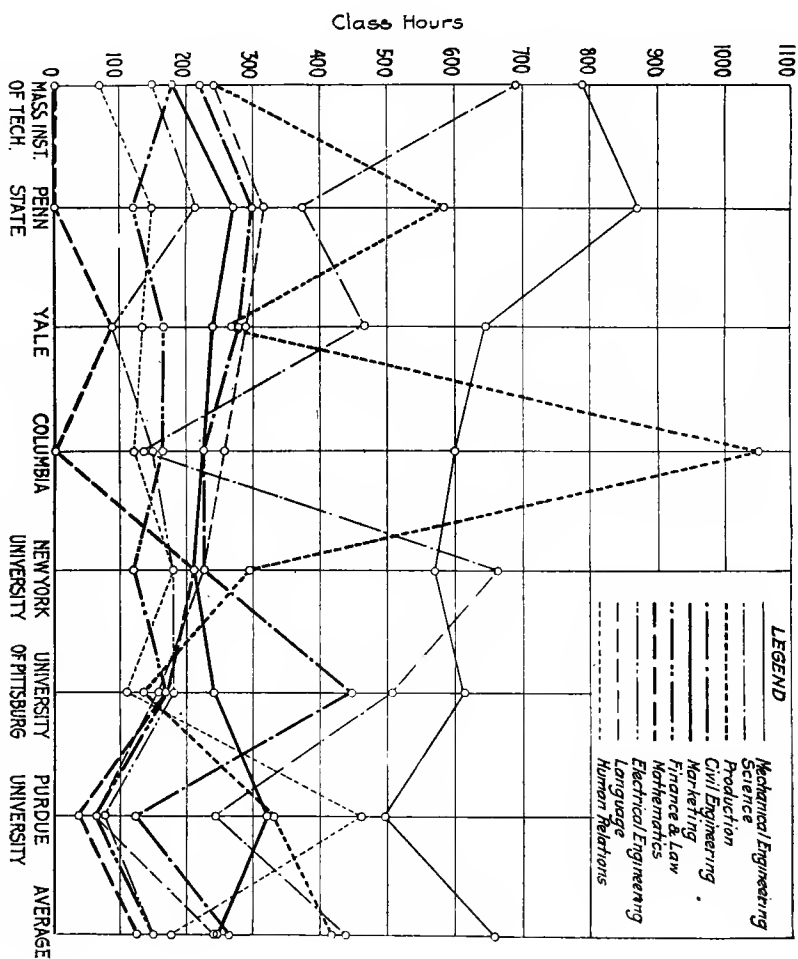


FIG. 1 CHART SHOWING THE NUMBER OF CLASS HOURS DEVOTED BY THE SEVEN INSTITUTIONS LISTED IN TABLE 1 TO THE VARIOUS INDIVIDUAL SUBJECTS

TYPICAL COURSES

As to the content of those courses now being given under the general title of "Industrial Engineering," by a half dozen or more of our leading Universities, the general aim is the same, but variously emphasized.

From an analysis of the actual class hours devoted to each subject there seems to be a trend in three directions. (1) Studies looking towards training of a broad executive character. (2) Those taking up the details and methods of production and (3) courses along business and commercial lines. What weight has been given to each of these three aspects of the economic substitutions can only be arrived at by a tabulation of the time allotted to courses classed under these heads. In the following tables an effort has been made to so group the various courses given at the seven technical schools selected that the dominating subjects may be apparent in each curriculum.

The class hours given in the tables represent as nearly as possible the actual time spent in lecture room and laboratory excluding all preparation hours. Also no summer work has been included in the figures, as comparative values between institutions under the co-operative plan and those not would have no significance. In "General Engineering Subjects," where shop work or surveying for example are given entirely during the summer in one institution and in term time in another, there is naturally a slightly unfair weighting of total hours, but this is not serious enough to nullify general comparisons, which is all that is attempted in this presentation.

DISCUSSION

The last course tabulated is a re-arrangement of that proposed by a special committee at the Philadelphia convention of The Society of Industrial Engineers in March 1920.

The publication of this course has accomplished a good deal, in that it has brought forth comment from various educators as to what really ought to be taught in the training of an Industrial Engineer—

One says "I have no quarrel with any one who wishes to give a course under the head of 'Business Management' or a similar title, but I do hold that if any 'engineering' course is given it should contain the fundamentals of 'engineering', such as calculus, applied mechanics, heat engineering, machine design, etc. I realize also that some men who have not this engineering training may make

excellent managers and I shall be very glad to pass such men over to such schools as will give them training in management, but I will object to having their training called 'Engineering' and to their receipt of degrees in engineering."

Another writes "I believe that the foundation of a course in Industrial Engineering should include 'Psychology-principles of human behavior' as well as engineering economics. Since the detailed course outlined is not heavier than our course in Mechanical, Electrical and Chemical Engineering, I believe the committee's suggestion does not fully utilize the possibilities of a four-year undergraduate course in Industrial Engineering of grade to correspond with the engineering courses now given in technical Schools of the first class."

Still another comments as follows: "First, I do not agree at all that calculus should be optional. As a matter of fact, it is not possible for the student to study intelligently a number of the courses listed in your scheme unless he has a knowledge of Calculus, unless indeed he is prepared to study these subjects 'parrot fashion' which, as you are well aware, is not the proper method.

My second objection is that I find no mention of 'Analytic Mechanics.' Now Analytic Mechanics is the keystone of the arch of an engineering course, and furthermore, again, without Mechanics many of the subjects that you have listed further along in the course would have to be given in an exceedingly crude and elementary fashion.

In other words, I think the course lacks the two subjects which are most important in the training of an engineer."

The quotations given represent opinions at three typical institutions, viz: Pennsylvania State College, Purdue University and Cornell University.

So far as the course criticized is concerned, it would seem that if the words "Optional" be stricken out and the subject of Analytical and Applied Mechanics be added, the proposed curriculum would not differ in essentials from those with which it is compared.

Referring to Table I, in the four sub-divisions under the Specific or Economic subjects of "Human Relations," "Production," "Marketing" and "Finance and Law," there seems to be the widest variation in percentages under "Production," with the one exception of Purdue University, under the heading of "Human Relations." The decisions of The Society of Industrial Engineers' Committee on curriculum would indicate that those institutions having the highest

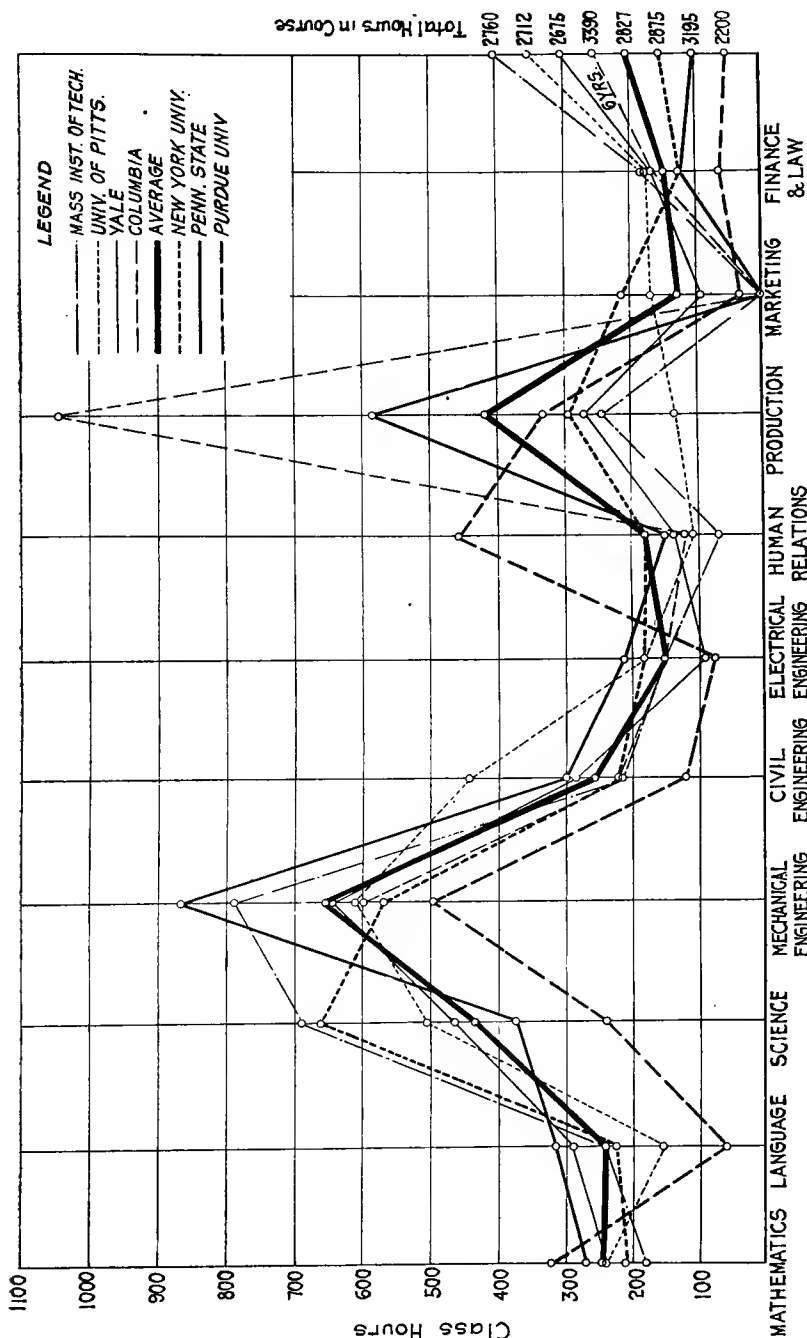


FIG. 2 CHART SHOWING THE NUMBER OF CLASS HOURS DEVOTED TO INDIVIDUAL SUBJECTS
AT THE SEVEN INSTITUTIONS LISTED IN TABLE 1

percentages under "Human Relations" and "Production" develop more nearly the ideal course.

In Table II by reference to the final averages of percentages under the three main headings, the University of Pittsburgh is the most representative in the column of "General Subjects," Yale University under the "General Engineering Subjects" and New York University under the "Specific Subjects."

It is the opinion of the writer that this diversity of emphasis at the different institutions is a very healthy condition, because it permits a prospective student to take advantage of any apparent aptitude on his own part in selecting the course best suited to his qualifications. In the usual engineering courses at most of our technical schools, the curricula are too much alike and the Colleges of Engineering ought to be more distinctive in the courses they offer and not all do practically the same thing. It would seem that The Society of Industrial Engineers through its special committee has performed a creditable piece of work in calling attention to the fact that industrial engineering education has at least started on the right track according to present day conditions.

That this field is a promising one is evidenced by the large enrollment at those institutions offering opportunities for industrial training. If this kind of engineering, whether it be called "Industrial" or something else, can be kept a basic course and not become too highly specialized, it will give the broadest type of training yet attempted and it should be accomplished within four years if possible.

NOTE—See pages 379 to 389 for explanatory tables of Prof. Bliss' paper.

Charts on pages 178 and 181 were prepared by H. M. Gano, Ass't Professor, Industrial Engineering, University of Cincinnati.

THE CHAIRMAN: It is always very difficult to show in any chart or tabulation the true status of what we wish to portray. For instance under the head of analytical and applied mechanics in the work given at the Pennsylvania State College in applied mechanics to our industrial engineers. This is exactly the same work that is given to our electrical engineers, mechanical engineers and civil engineers. They all get the same work.

Another thing that I notice under the head of Human Relations, in the Pennsylvania State College no mention is made of employment and of safety engineering which subjects are also given.

Again manufacturing processes is not listed. This is taught together with production control throughout the course in a number of other courses that is, the whole idea of production dominates not only the courses directly but also the shop work that is given, so it is necessary to think of the courses as perhaps embodying something that is not particularly evident on the surface.

Professor P. F. Walker of the University of Kansas sent an outline of their course in industrial engineering of which doubtless Professor Bliss knew nothing when he wrote the paper.

The discussion on these topics will be opened by Professor H. S. Philbrick of the Department of Mechanical Engineering of Northwestern University.

PROFESSOR H. S. PHILBRICK (Northwestern University): I have been interested in hearing the things that have been said this afternoon. I wish to speak first of the paper that was given by Mr. Stout. I think it was excellent. I have been listening to the discussions this afternoon from the point of view of the college that gives a broad, fundamental engineering education and also the college known as the liberal arts college. You know what the liberal arts college is, some of you probably graduated from such a college. The curriculum as it exists now, I am safe in saying, is quite different from the curriculum as it was when you graduated. Nearly all of these subjects which you have mentioned are given, say, in the University. We have a school of commerce and we have our college of engineering and students in the college of liberal arts are privileged to elect certain courses from the college of engineering and from the school of commerce.

I find in this paper of Mr. Stout's that the function of the American College is to give to industry men who have those basic qualities and tendencies necessary to develop the men into executives and leaders required. The function of the American College, we must admit, is broader than that. Not only the industries are looking to the American College, but the

learned professions. Public service and public life are looking to the American College, and the American College must meet the requirements of all of those interests, so the American College must be far broader than it would need to be if it confined itself to the most technical of the requirements of any one of the branches.

In connection with the paper of Professor Payne which was intensely interesting, as I looked over this data before I had no thought of it in this application. I think the basic idea has to be taken and the data studied carefully to see what conclusions we can draw. I should not want to select a Yale freshman as a general manager of my business over and above some of these other men. We have not got all of the qualities there. It is difficult to take a whole lot of blocks and make what we want out of them and the study of these qualities makes that clear.

DISCUSSION ON QUALITIES OF A SUCCESSFUL PLANT EXECUTIVE AND THE BEST WAY TO DEVELOP THEM

PROFESSOR H. S. PHILBRICK

Northwestern University, Chicago

The duties of executives of manufacturing plants or of industrial organizations may differ much in extent but are much alike in kind. Any executive within his sphere is first in command. Whatever he may have of staff or council he must direct and control. He has the responsibility. He must make the decisions.

He must have knowledge, wisdom, initiative, enthusiasm, and leadership. Many allied qualities, too, you will find in any successful executive. But, primarily, these:

1. Knowledge—He must know where he is, his place in the organization, his department, the relation of his department to the whole, and an ever widening appreciation of the relationship of the whole society.

He must know what he is doing, what his department is accomplishing. All the machinery of record, accounts, reports must tell him a true, useful, and immediate story.

He should know what is expected of him or what he is demanding of himself and just what progress he is making to his goal.

2. He must have wisdom—that product of knowledge, experience and thought.

3. He must have initiative to progress by his decisions. The sharp cut-water of a bridge pier separates the water but it does not move. The vessel separates the water by its motion. Initiative forces decisions. It does not wait for circumstances.

4. Enthusiasm is really many wonderful things. You can tell a man who has it for it leaves no room in him for cynicism and discouragement and doubt.

5. Leadership—No man can do it alone. He must have help and he must inspire it.

The Best Way to Develop These Qualities

As time goes on an increasing number of young executives will come from the colleges. The colleges and industries together will have to train them. Just what part I believe the industry should do, I don't want to discuss now. I am more interested in the work of the college in this partnership job.

Let me answer definitely this question. What kind of school and college training should a boy have to fit him to become in time the sort of person I have just mentioned.

The young man should have **mastered** the work in the grades, the fitting school, and college. (I have underlined the word "mastered". It can be done.) He should have spent several summers at work. His college curriculum should not be specialized.

The young man should get an accurate knowledge of the fundamental sciences: chemistry, physics, biology and mastery of mathematics as a tool; correct notions as to historic origins, appreciation of the development of civilizations and languages and literature; interest in economics, banking, government, trade and commerce. He should be able to think clearly and thoroughly. He should have the habit of coming to **know** things—an interest in knowing things.

I know there are curricula for training men for the industries. Such, I believe should be viewed as professional courses much as are courses in law and medicine and should be entered after college. From the professional schools there is one thing, however, which I would like to see more of in the colleges and that is the intense earnestness of the men in the work which they have chosen. An early choice of occupation I believe, leads to this seriousness.

To counteract in part the danger of making a tardy connection with the actual shop, the summer at the end of high school and two or three during college should be spent at work.

One thing I have only suggested is this. Industry wants young men who can be trained to know, to understand, to follow, and to develop the industry, but it wants even more to find some men who can signally lead. The college wants to be able to send men of this kind to you and to send men of this kind to the other professions and into other fields.

I feel that we have done two things: We have limited our scope of

engineering a little bit. The engineering trained man should not be afraid to manage, to go into the field of finance; he should be just as well trained for that and he will find that he can handle that as well as he can handle other things. That is largely, I think, a habit of mind that we must add to our engineering conception. (Applause)

THE CHAIRMAN: The next gentleman to discuss these papers is Professor Ben G. Elliott of the University of Wisconsin.

PROFESSOR BEN G. ELLIOTT (University of Wisconsin): When a person listens to all of the requirements of an executive that we have outlined this afternoon, he comes to the conclusion that the college which attempts to train a man to become an executive has a pretty big job on its hands.

For one, I am inclined to be conservative about this matter of specialization. I still believe that our colleges must offer more fundamental courses or, in other words, courses which are more fundamental in character.

Industry has in the past four or five or six years, perhaps in the last ten or fifteen years, been demanding of the technical schools in particular, that they turn out men with some special or particular training. The automobile people have been asking that they turn out men who are specialists in certain lines of automobile work. Other phases of industry have been asking the same thing, so when you put all of these demands together, you see that no institution can turn out a man in four years with specialized training in all of these different lines.

I am more firmly convinced than ever that our technical schools and institutions turning out men who are to become future executives must confine themselves to giving these students instruction in the fundamental subjects—natural sciences, economics, psychology, sociology and the very fundamental things that are needed by men when they get out into life.

When you look over the specialized courses that are being given by our different universities and colleges and the different degrees being granted, you come to the conclusion perhaps that we will have to adopt the Chinese alphabet if we are to make up many more degrees to give to men at the end of their college courses. I think our colleges are getting too specialized and are not keeping close enough to the fundamentals.

Industry in all walks of life is demanding good men, men with a good training, and yet they are trying to speed up this process. Through better methods of teaching perhaps better jobs of teaching can be done, but I doubt very much if we are going to be able to speed up this process of developing men, developing some of these qualities we have heard discussed this afternoon.

Industry in the past has, I think, been putting up to the colleges the proposition that could not be met. Industry does not want men with specialized and superficial training, they want men with good foundations upon which industry can itself build the type of men they want. That is the job I think that the college should do—build the foundation. It can do nothing more.

We have heard a lot this afternoon about colleges turning out highly trained and developed men. No college, no technical school can turn out a highly developed and skilled engineer, all the college can do is give the man the fundamentals upon which when he gets out of school he can build an engineering career.

Industry must realize that four years is a mighty short time to give a man a training or to give a training that usually goes into a college course, and into those four years we should put the fundamental things that a man should have when he goes out into life.

Another point that has not come up this afternoon is this: You have been talking about training men for industrial leadership in industrial life. We have said nothing about the life that man must lead outside of industry. There are some things in the fundamentals that can be given to a man, things which will help him in industrial leadership although they are qualities he will need more outside of his industrial life than in industrial life.

I am becoming more and more convinced, also, as Mr. Dooley said about the boy who hated to read books, that it does not make much difference what books a boy reads as long as he hates them. I think it does not make a great deal of difference what courses we give in our technical schools as long as they are fundamental. We give the man a fundamental training so that he can go out and adapt himself to such conditions as he might run up against and then point to him the way. If he wants to go into some specialized line such as industrial leadership, the way can be pointed out to him. Beyond that I do not think that the college can do very much.

Give a man a few of the fundamentals, teach him to work. We have not heard anything about that this afternoon. Get industry into the frame of mind where they are not going to demand too much and I think our industrial leaders will be forthcoming. They might not come from the technical schools alone; from the technical schools, colleges of art and science and perhaps from the law schools. They are coming as soon as industry does not demand too much of the man when he comes from school. (Applause)

THE CHAIRMAN: Professor Elliott's remarks ought to make some

men rise to their feet. I am going to give them that opportunity in a few minutes.

Professor Gano of the University of Cincinnati will add a little discussion to our papers at this time.

PROFESSOR GANO: In the first place, while I do not believe in propaganda in a meeting of this sort, I have studied this question from the standpoint of the University with which I am connected in Cincinnati, which is a cooperative school, and what little I have to say will be based on that.

We have gone at the proposition in this way. In the first place, we got out the dictionary and looked up the meaning of knowledge, science and engineering. We found that engineering is applied science. The situation, then, seemed to demand ability to apply science to both commerce and industry, commerce as distinguished from industry. Therefore, we have already under way a commercial engineering course in which the first two years are entirely on productive work in shops for the student and the last three in specialized work. All of our work the first two years is identical in school and the last three years the work is specialized. We expect the men in the first two years to find themselves through inspection trips, work in industry, observation, counsel, factory or coordinators of the school. This they are doing and we hope to develop men who will make competent executives in commerce and industry through these courses.

In the first place, in consideration of the development of the executives I want to tell you of a definition that I heard two workmen in a plant in which I was engaged give as the meaning of executive. One of the workmen had found a technical magazine of some sort and he was reading it. He turned to the other workman and said, "Say, Jim, what are these executives this book is talking about?" "Why, Bill, don't you know that?" the other replied. "An executive is a person who executes people." (Laughter) Had he left off the last word it would have been all right.

An executive is more than a man who executes; he has to do a lot of thinking and planning as well as execution.

The proposition that faces the universities, and we recognize it, applies to both industry, commerce and students, and in addition to that, the people of the country. The proposition that faces us is to take the raw material which comes to us and is suitable and to give those men the training that will enable them to make good as executives, as leaders. You cannot make steel, for instance, out of putty. Certain things necessary to leadership are inherent and certain things are adherent. If a man has character when he comes to a university, much of his problem is

solved. If he hasn't it, but has the foundation, it will be built up. The home training counts a great deal in character, in personalities, but I don't think—I would like to differ with Professor Payne in this matter of intelligence—that intelligence is the only fundamental, the only absolutely necessary qualification. It is necessary and it is a very valuable guide, but I would like to mention an incident of a chemical engineer who has marked intelligence. His work has shown it in school and outside, and he shows every ability in the world and yet he has proven himself hopeless as an executive. His personality is such that people instinctively dislike him.

I have only one other thing to say and that is to mention the questionnaire which I presented to some of the students at the university when our Chairman asked me to discuss the papers.

I asked them to tell me in written form what they thought were the necessary qualifications of an executive and how they thought they might best be attained. In the answers to these questions they have listed all of the qualifications that we have had at this convention and possibly a few in addition. All of the answers were good. The men were all thinking about the proposition and had more or less excellent thought and were evidently looking forward to the opportunity to develop into executives with one exception and I feel inasmuch as they were all so good that I would like to tell you of this exception. Where the man got his ideas I do not know.

He said in the first place an executive should not make mistakes but that if he did he should not be found out, that he ought to keep it quiet. If he was found out he ought to be willing to admit the mistakes and apologize to his subordinates.

He said that a man should have a little religion but not too much, that if he could falsify the income tax and profits tax returns and undervalue the property, etc., it was his duty to do that—anything he could do to save the company money. He said that he should always be full of pep when in view of his subordinates. I had a long talk with that man. I don't know whether it did him any good or not, but that case was so amusing that I thought I would mention it. It was sad for the man.

Our commercial engineering course at Cincinnati has been under way for three years. The men are making good already in commerce in their work. We have hopes of turning out some men that will be of use to industry.

In that course and in the industrial engineering course which I am working out at the present time, we are including all of the fundamental engineering subjects, including calculus, largely for the reason that we think it helps a man to think and to think straight and partly because we

think he needs that knowledge. Then we are, of course, adding the subjects such as industrial history, economics, business law and accounting because an executive if he is going to control men who handle such things as accounting, sales, marketing, etc., must know something of them.

We are trying to emphasize the importance of some of the languages and of English, written and oral. The average engineer in past years as graduated from engineering colleges was rather weak on English and an executive of the first water must know how to handle the English language. He has to know how reports should be made up. He has to know how to talk.

A great deal of the activities of an executive are dependent upon his ability to think and talk and write in a logical, convincing manner.

I do not know of anything else that would be of interest here this afternoon except to say this: In our efforts to work up a course or provide what we think the student in industry should have—I am working on it with the assistance of the university—we shall be glad to have any assistance that you men can give us in educational work in industry. We won't all agree, but the S. I. E. has pointed out this need more emphatically than any one else and they have already been of material assistance in this work. I think it is a big problem before us and one which can be solved only by working together in all respects. I am very glad to have had this opportunity, Mr. Chairman, to attend this meeting and express what few opinions I have. (Applause)

THE CHAIRMAN: We are very glad, indeed, to receive these opinions. We have a little time left and the meeting is now open for general discussion.

MR. D. E. WRIGHT (Camp Grant): I work in connection with the War Department. I trust that Professor Payne will pardon me for undertaking to defend, explain and possibly clarify his reference to these intelligence test charts. I feel a peculiar proprietorship with them because I am connected with the War Department in administering tests of this sort to the men in the Army, and Professor Philbrick has made some remarks about the value of the intelligence tests that leads me to believe they might be misunderstood. Professor Philbrick said that he would not want a Yale freshman even though he had a high intelligence rating in preference to men who had other qualifications.

The fact is that these intelligence tests, as they are called, and the ability in intelligence or the quality in intelligence are one of the minimum requirements and should not be understood as being the whole basis for selection or the whole basis for official performance. It is one of the things that are practically necessary and it is unnecessary to say that

intelligence is the fundamental thing because without that a man has no chance of getting along at all.

To illustrate from this chart, take this diagram for example which represents the spread of the middle fifty per cent of common laborers, meaning that fifty per cent of all common laborers examined by these intelligence tests made a reading of somewhere between twenty and sixty; twenty-five per cent of them made below twenty per cent and twenty-five per cent of them made above sixty or sixty-five per cent.

Of course common laborers are probably the lowest order of intelligence of men who are supporting themselves and while you do not necessarily want to pick out a laborer on the basis of his intelligence, you can say on the basis of a draft of this sort that if a man does not have an intelligence rating of twenty the chances are about one to four or three to four—in other words he has one chance in four to be able to support himself at all. The chances are three to four that if he has a rating below twenty he is dependent upon society or ought to be closed up in some institution for mental defectives.

I should say that these scores are all made up on the basis of examinations actually given to large numbers of men in the army and they simply represent the actual facts of the situation. Of all telegraph operators given the intelligence tests—and there were thousands of them—fifty per cent of them had a rating between sixty and one hundred. Now then, if you were going to employ a telegraph operator and give him this intelligence test and he would make a rating of between sixty and one hundred, you would be prepared to say that the chances are fifty to fifty that he would make a good operator. If he gets below this sixty you probably would not want to hire him because the chances are three out of four that he would not be qualified.

There are some qualified telegraphic operators who made scores less than this. We always go on the probabilities of the situation and you would not be justified in hiring a man who had one chance in four of making good when you had other applicants who had three chances out of four. A man who makes a rate above this has three chances out of four.

The same is true of the professional and clerical groups. With respect to professional groups, it has been found that of professional men who have been given the intelligence test, only one-fourth of them make a rating below one hundred. If you were in a school where you were giving training to men and would give these intelligence tests and found that a particular individual made a rating below one hundred, if you were doing vocational advising, you would tell him that he had better take other work

because the chances were only one in four that he would succeed in professional work.

On the other hand, if you were employing laborers or men for other positions and you had among your group of laborers a man who had intelligence rating of over sixty, you would say, "Why are you working as a common laborer? You have intelligence that would fit you for these higher grade positions. Why don't you consider taking up training for one of these other occupations?" In that way you would guide him into an occupation where he would be more useful to himself and to his organization.

One more word: The Army which is ordinarily not understood as standing for much except what they can definitely see, has gone on record in its educational system for exactly this system of measuring the ability of its soldiers. You know that the army has during the last year or two conducted an educational training program for the men of the Army and one of the coordinate organizations or divisions of that Army educational program is the Division of Testing and of Grading of which I happen to be in charge. They also have a Division of Vocational Training.

This selection of men on the basis first, of their intelligence tests, administered by the Division of Psychology, and on the basis of trade classifications, made such an appeal—in fact it was an absolute necessity for the efficiency of the Army—that they have decided to continue that sort of work in connection with their general educational program. If the Army takes up a thing like that, it obviously has demonstrated its efficiency to a great extent.

THE CHAIRMAN: We are very glad to get this illustration of the Army tests. I think it also displays the efficiency of Professor Payne. If anybody—some of us have served in the Army—can get something from the Army without giving a receipt for it, he has some efficiency, because of the several things we learned in the Army, one was, never to give a receipt and the other was always to get a receipt if you are giving to any one.

PROFESSOR PAYNE: The Army gave a receipt to the University of Minnesota for the charts similar to these they have at camp.

MR. W. M. C. KIMBER (Leeds & Northrup Company, Philadelphia, Pa.): I have thought of an incident along the lines of Professor Elliott's remarks. I have a friend who is a graduate of Cornell University. He graduated in 1890 and is at the head of a research department corporation. He is a remarkably intelligent man and has done very good work but he asked me the other day in reference to two sons of his as to whether he should send them to a technical college or a liberal arts college. I graduated from Haverford College, Pennsylvania, which is known as a liberal

arts college. I told him that I would send them to a liberal arts college and let them specialize later.

My reason for giving this advice was because I have seen that he has no interest at all outside of his business. He goes home at night and the only thing that he can find entertaining is a study of scientific facts. He does not know anything in arts and in literature and he has felt it seriously.. I want to bring that up here as a thing that should have some consideration in these college curricula. If a man has nothing outside of his business, he loses a lot.

MR. STOUT: There is one point in connection with these charts that I wish to bring up and also in connection with the little paper that I gave and that is this: That I have brought out one idea that I did not greatly emphasize, however, and that is the desire for getting a man into the right vocation, the right field of activity. I am speaking now from the viewpoint of the industry. I have seen a great number of men enter positions in industrial life only to find out that they were in the wrong jobs. It is a great loss to the industry and a great loss to the man. This past summer I received a great many letters from college men that I had met during a trip through colleges in the earlier spring. I went to colleges in search of men and met a great many college graduates that I did not hire and later during the summer and fall I received a great many letters from these men asking me if I could hire them and stating that they had gone to a certain firm thinking they had gone into the right work only to find out that they had not and they wanted to know if I could hire them and train them for the right job.

Now if the colleges through some tests such as these could divide those men and send to us men who are qualified for the positions that we have open, they would do for the industry a great work.

MR. H. B. DUTTON (Northwestern University): In connection with the charts here, it might be of interest to you to know that we have by faculty action decided to make experimental tests. We have proved one thing, the mental alertness test, and we are also planning to include a rating of the man by his instructors during the first two years. In our plan of teaching we receive a man after he has had two years of college work and then put him into a professional course for which he has already had some preparation.

Now as a man comes into the course we are planning, from a purely experimental way at first, to endeavor to ascertain what his intelligence training is and get a rating from his previous instructors as to his character, attitude towards his work, etc. Personally, I feel that the subject is one in which there is need for a great deal of caution. I think for one

thing that lack of intelligence is almost an indication of lack of ability for certain fields. There are a great many more tests that you have to apply. I have a few doubts as to the intelligence tests we use now. We have given tests a number of times. My own conclusion is that there is a certain weakness in the tests so far in the tendency to show the quick, superficial intelligence.

As an illustration, we gave the test on a group of boys and men working and taking our night courses. I happen to know one man who got a low rating on the test and he was one of four or five successful brothers who are running a large foundry. This type of man was the slow type. Give him a question and he would think a half minute and look worried but his answer was usually right.

He apparently had excellent judgment and a slow type of intelligence.

PROFESSOR PAYNE: If we should give these intelligence tests and let them have all the time they wanted, they would all get one hundred.

MR. DUTTON: The test does not display all of the types of mind. I think, also, that there is a lack of correlation from this particular factor. There are other factors such as a man's attitude towards his work, his working habits, etc. His physique is important, also. We are using the test but with certain restrictions or reservations. I am very much interested in the discussion. I have been particularly interested in the point of view Mr. Stout has presented regarding education as being the first step and indicating the need for continuation of the process in business. I feel that there is a great field there that we are just beginning to see.

MR. WRIGHT: These tests were gotten up quickly during the war and they were crystallized by applying them to some million and three-quarters of men, and no one has been particularly interested in revising them since that time until we have started the work in the Army and we are now engaged in a revision of the tests.

THE CHAIRMAN: We use mental tests at the Pennsylvania State College for all of our freshmen and we have given intelligence and trade tests to our senior students in Industrial Engineering. We also have a personal system in which the record of the student is kept and on which the ratings of the student made by the various instructors are recorded so that when the student graduates we may file away this personal record which, by the way, includes a photograph of the student, and use it for future placement.

Everything has an end so we must draw this meeting to a close.

ADJOURNMENT

GET-TOGETHER DINNER MEETING

At Hotel Pfister

THURSDAY EVENING, APRIL 28, 1921

A Surprise Party for the President

Chairman: IRVING A. BERNDT

Vice President, C. E. Knoeppel & Company, Inc., New York City

THE CHAIRMAN: On the program tonight this dinner was announced as "A Get-Together Dinner", and no doubt through the minds of the members of the S. I. E. has been running the thought—get together for what?

The S. I. E. has not been in the habit of getting together for no particular purpose and I don't believe ever will get into that habit. Tonight we are gathered together for a real purpose and because of a real occurrence. We are gathered to commemorate one, if not two, big events in the history of engineering.

It was early in 1917 that the movement started which resulted in the organization of The Society of Industrial Engineers. Engineers in various parts of the country had felt for some time that there should be a co-ordination of the various groups. Some of those interested in the movement got together and discussed tentative plans for a national organization. The work proceeded rapidly and a few weeks later, at the close of a national convention of the Western Efficiency Society in Chicago, the S. I. E. was formally organized and started on its career.

One of the things that was very necessary, we soon found, was competent leadership. Mr. Emerson told us what qualities are needed. As one of a committee that was appointed by the first Board of Directors to search the country for that leadership, I remember that we had a great deal of trouble in finding the man who could fill the bill; the man who had that character, courage, competence and charm that is necessary. We gathered together a long list of names and went over them very carefully, but we found great difficulty, because of the war, in getting the right man. Eventually we were successful. But war work made so many important de-

mands on our first president that he was compelled to resign in about a year. So we had all our work to do over again. At the close of the war, or at least soon after the signing of the armistice, we started in again to find another real leader.

We were very fortunate, at that particular time, to find the man and I am sure that you will agree with me that we did find the man who had all those qualities necessary for leadership.

About a year ago a big engineering problem got under way. That was the question of gathering together in one organization all the engineers in the country, not only engineers of one branch of the profession, but all the various associations and societies of engineers representing all branches of engineering.

The S. I. E. was represented at the first meeting in June 1920 by our president, and again at the next meeting in November. It was at this meeting that the organization began to take real shape and The Federated American Engineering Societies was organized.

Our president was elected the first treasurer and then was made chairman of the nominating committee, to select an executive secretary. That position required a man who had all those great qualities of leadership, because he had a real problem, he had no end of a program ahead which even now I don't think we realize the significance of, nor can we conceive of it.

And it seemed that gradually, one step after another, our representative and president was brought into the activities he was made the vice chairman of the committee on elimination of waste in industry and I understand that it was necessary, finally, to wreck that committee in order to make him Executive Secretary of the Federated Societies. I think that's a tribute, first, of course, to the man, and second, indirectly of course, to this society. He will lead the 60,000 engineer members of the federation and direct the activities of that organization, coordinating some twenty very important committees.

And this meeting was called to commemorate and congratulate our president, Mr. L. W. Wallace, on that appointment.

I am going to ask you now to join with me in singing his praise, lead by the band, and we will all remember that in doing that we are not only remembering his first election as president of the S. I. E. but also his election as the executive secretary of The Federated American Engineering Societies.

THE CHAIRMAN: I know there isn't a man here who would not like to join me in this tribute.

The time is short but it is fitting that certain men who are with us tonight be called on to say a few words. I think we should be glad that we also have as one of our members the man who preceded Mr. Wallace as temporary executive secretary of The Federated American Engineering Societies before Mr. Wallace was permanently appointed—Mr. L. P. Alford.

MR. L. P. ALFORD: Our chairman has very briefly sketched some of the occurrences that preceded the election of the executive officer of the American Engineering Council of The Federated Engineering Societies.

It was my privilege to serve as one of the members of the committee that made that selection and what your chairman has said is literally true—we wrecked that committee in order to work through a delicate situation and secure the man who was wanted.

Following the usual method of engineers, we prepared a specification before we attempted to make this selection, and some of the elements of that specification were these—first of all, the man to be selected executive officer of the greatest engineering organization in the world must be an engineer of recognized attainments in the American profession; he must be a man capable of inspiring other engineers and welding into an organization something like 250,000 engineers who were recognized as members or eligible for membership in constituent societies of The Federated American Engineering Societies—a real leader and inspirer of engineers; he must be possessed of balanced judgment, of tact, of diplomacy, of cultural background fitting him to enter the life of our National Capitol where so much of the work of the Federation must be done; he must be capable of exercising that executive power, that fearlessness in action which is necessary to bring results in our national political arena, and above all, he must be capable of holding steadfast and true the great ideal around which the Federation has been founded, rendering disinterested service to the community and to the state and to the nation.

Such, in brief, was the specification which was written before an attempt was made to make a selection. Finally, after deliberate study, the choice was made, the specification was met, and by unanimous vote of the Executive Board of the American Engineering Council, the choice fell upon my well esteemed friend—in fact, more—my well beloved friend and the honored president of our Society, L. W. Wallace. (Applause)

THE CHAIRMAN: I am sure that we are all proud to have Mr. Wallace as our president. We hope that we may continue to have him guide and lead us onward.

We are now going to hear from Mr. Gilbreth.

MR. FRANK B. GILBRETH: I consider it a very great privilege to give my testimony for my friend, Wallace. I am willing to admit that

he has all the good points my friend Emerson specified as necessary to be a leader of men; I am willing to admit all that Alford has said, but this man Wallace has got to be watched.

I'll tell you a personal experience I had with President Wallace because you will hear enough good things about him tonight and he doesn't need the good things. He spoiled the Fatigue Committee dinner last year by coming in with a suggestion of how to put a rubber band around his head here (indicating) so as to save motions and so as to show how high up to wash his face. And that after all that I have done for him!

What I have done for him dates back to the time before he was our president, when our good friend Dent came to me—not to Alford, Emerson, Farnham, or the rest of them—came to me and asked, "Who shall we make President of this Society?" I said, "Wallace", right like that (snapping fingers). I said Wallace. A long time after that I wanted to get a favor from him and I said, "By the way, do you know, old chap, that I really got you the job of presidency of this Society"? "What! you don't know that I really was the one who started you on your successful career"? He looked at me as though he had never seen me before and said, "How's that"? I said, "When Dent came to me and asked me who to make president of this society, I said, 'Wallace' ". "You don't say so. My goodness I'm glad to know that." He then inserted my name in his note book and said, "You're the nineteenth man that made me president of this society." (Laughter)

THE CHAIRMAN: And in that list of nineteen, I was the first. (Laughter)

Among the industrial engineers is a man to whom we owe much of our information and philosophy—Mr. Harrington Emerson, who needs no introduction.

MR. HARRINGTON EMERSON: You remember that yesterday I said that great leaders needed four qualities—character, competence, courage and charm, and after I had spoken, Mr. Miller got up and also spoke as to the qualities that a great leader needed and he put foremost the quality of vision. I think that I should add that, since I have known Mr. Wallace, to the other four qualities that make the great leader, for not only does he have character, competence, courage and charm, but he also has had from the start, vision. (Applause)

THE CHAIRMAN: One of the directors who was among the first group and who knows about the problems of selecting our first president during the early days of the society, was Mr. Norman Hill.

MR. NORMAN A. HILL: You have all heard so many of the good things about Mr. Wallace I will have to go back a little and mention to you

something you may not have heard so much about—the very remarkable work he did at Evergreen in the Red Cross Institute for the blind soldiers, where they have re-educated the blind soldiers.

The work there was one of the most interesting things I ever looked into. It was handled in a really wonderful way, and I speak with some knowledge because I looked into similar methods in Canada and I know something of the methods pursued in England, and the Evergreen Institution is something that we may be proud of. Personally, I attribute the success at Evergreen to President Wallace's effort, his wonderful personality, the qualities just mentioned by Mr. Emerson, and his patience and understanding that is required in the handling of blind men.

You probably realize that blind men are apt to have their feelings very much upset and get a very dark view of everything that goes with the loss of sight. The most difficult thing, perhaps, to contend with, is to get them cheered up. The work at Evergreen I am sure will be a very memorable record of the ability of our president, Mr. Wallace. (Applause)

THE CHAIRMAN: Those of us who have had the privilege and opportunity of working under the supervision of Mr. Wallace have had a real privilege. I have said a good deal on that point and I am going to ask our Vice President in charge of Education, Mr. Dwight T. Farnham, to say a few words.

MR. DWIGHT T. FARNHAM: Mr. Emerson has stated that Mr. Wallace has vision to look into the future. I may not have vision to look into the future but I am going to pause a moment to look into the past—the very dim, dark past of Mr. Wallace.

Mr. Wallace, in his early days, when he was at the university, went to a neighboring university for a football game. This story that I am going to tell you shows that he possesses courage. The men who supported the team in this neighboring town had a reputation of being very Scotch, and as a result, it was exceedingly difficult to get them to bet any money on their own team. Mr. Wallace, having experienced that peculiarity, decided that men with courage ought to make something out of it, and therefore at dinner that night, when they were celebrating the victory, he offered to bet one of these Scotchmen five dollars that he could drink a pint bottle of champagne without removing his lips from the bottle. They took him up on that, and I understand it can be done. (Laughter)

After that, still giving thought to their Scotch characteristic, he offered to bet them ten dollars that he could drink a bottle of tobasco sauce. They thought they had him then, but he took the sauce and mixed it with olive oil and managed to get away with it.

Thereupon, he offered another bet that for \$20.00 he would undertake

to eat the lace curtains, and he got no takers. (Laughter) "Courage, like virtue, is not without its own reward". (Applause)

THE CHAIRMAN: Those of us who gather at these conventions and have had the opportunity of meeting Mr. Wallace, and the directors who have attended the Directors Meetings, of course have been very much impressed by that vision and we know there is one man in the Society who has been especially privileged—our business manager, because he has had the constant guidance of our president.

There is one thing that I forgot to say before, and that is that the president of the S. I. E. is a real honest-to-God president. According to our constitution he has not merely to be a man to preside at the meetings, but a man who really directs the activities of the Society through the Business Manager. It is a real job. Mr. Dent will now say a few words.

MR. GEORGE C. DENT: I believe that associations like individuals, have lucky days. It certainly was a lucky day for the S. I. E. when Mr. Berndt and the other eighteen men suggested Mr. Wallace for the presidency. It is a fact that more than one member did suggest Mr. Wallace, and Mr. Gilbreth shares in the honors of being one of the nineteen wise men.

Our membership has increased 170 per cent in a little over two years. Since the time that Mr. Wallace came into the Society in December 1918, we really date the work of the Society as an industrial organization; previous to that time our efforts were confined to war work.

One notable feature of Mr. Wallace's work in the Society has been that he has always acted absolutely on the square with every member of the organization. He has never played favorites. He has never favored the directors, nor the executive committee, nor officers of the chapters. So far as he is concerned, we are all members of the S. I. E., and never in my intimate association with him, has he made one suggestion that meant favoring one member as against another.

Those who really desire to help in the work of the Society have only to display sincerity and energy and they will be quickly recognized by Mr. Wallace and given an opportunity.

The one thing I am afraid of is, that the importance of the work of The Federated American Engineering Societies may some day be the cause of the S. I. E. being forced to look for another president. May that day be long deferred. (Applause)

THE CHAIRMAN: We have learned how Mr. Gilbreth made Mr. Wallace president and started him on his merry way, and how eighteen other gentlemen have claimed the same honor. I think it would be fitting to ask Mr. Wallace how it really happened.

PRESIDENT L. W. WALLACE: There arise occasions in every man's life when words utterly fail him; when his mental faculties cease to be active and fail to do the things they should because of the fullness of the heart. It has been my good fortune as I have traveled along the road of life, to have had a few such experiences of this character. And after each I have remembered that I very inadequately expressed the thought that I desired to. I know now that I shall not tonight be able to fully and comprehensively express the gratitude of my heart.

I am not unmindful of the very kind thoughts of the members that have spoken and am deeply appreciative of the same. I am not unmindful of the spirit that suggested this meeting. I wondered why, as I looked over the program, that I was left off as Chairman of this evening's meeting. Now I sense the fullness of the reason.

I am not unmindful, also ladies and gentlemen, that my friends in the enthusiasm of the moment and out of the fullness of their sincerity of friendship and appreciation, have overdrawn the picture. They perhaps have failed to realize that the specimen selected has not come up to the full standard of the specifications set. However, I am conscious of it myself and know that I do not in any way measure up to some of the very fine standards that have been set forth tonight and the intimations given that I fulfill those standards. But I do want to say to you that being mindful of the fact that I do not live up to those standards, yet I do not know of any man that more earnestly strived from day to day to live up to such ideals of life. I have always had standards and ideals before me; I have always had uppermost in my mind the desire to render such service as I could to my fellowmen, and to do what good I could in the world as I traveled along life's way.

Mr. Dent is right—I have never consciously endeavored to favor anybody. As an apprentice in the shop I attempted to be as courteous and considerate of the floor sweeper as I was of my superintendent and master mechanic; in my college days I was always as conscious of the rights and privileges of the freshmen in the cadet corps, as I was of the rights and privileges of the commandant of cadets to whom I was responsible; as a faculty member I always endeavored to pay as much respect to the freshmen in the student classes as I did to the president; as a factory executive I was more particular to be courteous and considerate to the men and women at the bench than I was to my general manager and my president. I have always endeavored to make those that might be in the social and industrial scale a little lower than I, because of their misfortune and my fortune perhaps, feel free and easy and to make them realize that I was endeavoring to be a friend to them.

It is those qualities in the habit of life that as much as anything else have won for me so much friendship, support and cooperation as I may enjoy tonight. It's a good principle—I hope you will bear it in mind, and you men in the shops, especially you younger men and all of you older ones, remember that under the jacket of the workmen there lurks the same aspirations as there does under the jacket of any statesman or any great industrial leader. You can get from him the cooperation and effort that you deserve and that you desire if you recognize that he is a human being, moved by the same motives, responsive to the same kind, human, frank and honest treatment as any other man or woman.

Courage, character, competence and charm—yes, those are great qualities. Those are the qualities that are necessary, I agree with my friend Emerson, to be a leader of men, but with those also (and charm indicates it) there must be tact, love of mankind, and a desire to step out of your way, if necessary to render some service to the men that you meet as you travel through life. If we had more men and women in the world that lived up to those qualifications and those instincts of life, we would see less of strife in the world and more of happiness and satisfaction. After all, there isn't much to be gained in life outside of the satisfaction that you have in making those about you comfortable, happy and cheerful.

It has been a great pleasure to work in the S. I. E. All of the success of the society to date has not been due only to your president but there has been working with him an honest band of men who have devoted their time and efforts and best thoughts to the best interests of the society. No president of any organization, nor secretary, can make it a success however able he may be, however fully he may live up to specifications indicated by our friend Alford tonight. It is only through the help and cooperation of those about one that he is able to do the things worth while. So the S. I. E. has come up to this point, to this degree of success that we recognize tonight, not because of the efforts of your president but only because of the efforts of your officers, your business manager who works earnestly all the time, and to you men and women in the ranks. And note, please, that I use the term "men and women" advisedly. I am glad that the women are coming into the society—they have a place there. I hope that the society, through the women members and the friends among the women, will not only do something worth while in industry but that it will be able to do something worth while in the American homes of this country where there is just as great a need for the standardization and elimination of waste and elimination of fatigue as there is in industry. So, we have been able to do all of these things because of the cooperation of all of you.

The Federated American Engineering Societies represents one of the

greatest movements ever undertaken by the engineering profession in this country or abroad. In The Federated American Engineering Societies lies one of the greatest possibilities for the engineering profession to render public service of great value to this country than any other movement that has yet been launched. Please remember that in the constitution of the Federated American Engineering Societies its purpose is stated to be that of rendering public service. That is the primary purpose of the formation of the organization—that the engineering brains, experience and talent may be utilized in the interest of the public wherever technical knowledge and engineering experience are required.

I indicated two or three lines of possible activity in my address yesterday afternoon. If the Federated American Engineering Societies can do only one thing within the next ten years, and do that in a high grade manner, it will have justified its organization—namely the bringing about of the reorganization of the Federal Government whereby we will have greater efficiency and less loss of effort and the expenditure of the people's money in a wasteful way.

So the purpose of the organization is one of public service. It is to bring together in one unit all the engineering Societies of this country. I am very proud to know that the S. I. E. is one of the charter members of this great movement. The Federated American Engineering Societies, however, will not be able to accomplish the most and realize its great possibilities, however hard its president and executive secretary and executive boards may work, unless it has behind the work the active support of every engineer in this country. I invite from each of you tonight, as members of the S. I. E., your earnest cooperation and constructive efforts in all the movements that may be launched by The Federated Engineering Societies. I assure you that there will not be anything launched and pushed by that organization unless it has in it something that is going to lead to constructive service to the public and to the engineering profession. I speak with assurance because on the governing boards we have some of the keenest, most alert, most experienced and broad-gauged engineers of this country. Those men are not going to support anything that has not in it real merit and which will not be worthy of the earnest support of every engineer, and therefore of every citizen of this country.

Again I want to say to you that I am indeed appreciative of the kind words expressed tonight. I have been appreciative from time to time of the words of satisfaction that have been expressed to me by the individual members. I know that I have not been able to express fully what was in my heart but I hope I shall be able to show by the character of service that I render that I have been indeed appreciative of all these kind things.

Unfortunately I shall not be able to stay to the end of the conference. I arranged everything with the purpose of being here until the last word was said tomorrow night, but telegrams have come which make it necessary for me to be in Chicago tomorrow at ten, Detroit tomorrow night, Indianapolis Saturday, New York Monday and Washington Tuesday. You see I have a schedule for the next three or four days that makes it necessary for me to leave early in the morning. But I am leaving in full confidence that the conference will be conducted properly because we have a Board of Directors, Vice Presidents and others that are competent to carry on. It will also be an indication of whether or not I have been a good executive, because if I have been a good executive, I ought to be able to drop out and nobody know that anything has occurred. So I am sure that the sessions of tomorrow afternoon and tomorrow evening will in every way be successful and fulfill the standards that we have been endeavoring to maintain. Again let me assure you of my appreciation of your cordial friendship, your words of satisfaction, and the confidence that has been expressed in me by my colleagues on the Board of Directors. (Applause)

THE CHAIRMAN: Before we adjourn it is fitting to announce that one of the factors that helped to make this dinner meeting a success was the thirty piece band that was sent to us by The Kearney & Trecker Corporation of West Allis, Wis., a band made up of the employees of that company, called their Industrial Band, and I know that we are all appreciative of that unexpected contribution to this gathering. We are indebted to the members of the band for their kindness in coming here this evening.

Mr. Wallace has lived up to every single thought that has been expressed of him, and all the good things that have been said of him tonight. In his response, instead of doing what probably nine out of ten would have done in expressions of modesty, etc., Mr. Wallace has given us some real inspiration. He is sending us away with some real messages, giving us some real visions, and in his response we have expression of everyone of those good qualities which made him our leader and which made him the leader of all the engineers in the United States today.

In adjourning this meeting now, I am sure that you will agree with me that we did get together for a real purpose.

THURSDAY EVENING

April 28, 1921

Chairman: LEON I. THOMAS

Managing Editor, "Factory"

THE CHAIRMAN: Ten years ago this coming summer, there came into my office one day a man who said he was going into manufacturing. He knew very little about manufacturing but he was going to take a position in a manufacturing plant and he wanted to know if I couldn't suggest plants that he might visit in Chicago, where visitors were welcome and where he would be free to talk with executives and get ideas.

The significant thing that he said, however, was this—"The business that I am going to associate myself with is the overall business, but I don't care to go into overall plants—I would prefer to go into some other plants". That seemed to me the important thing because he realized from the very start that many ideas were liftable from one industry to another and I think if there is anything that has contributed to Mr. Pool's success, to his own company and to this society, it is his ability to recognize a good idea when he sees it and put it in. I am sure that we, on the other hand, are going to profit if we take the same broad mind in listening to Mr. Pool's ideas to-night.

It is with great pleasure that I introduce to you Mr. C. L. Pool, General Manager of the Sherman Overall Manufacturing Company, Sherman, Texas, who will talk to us on "Industrial Leadership as a Factor in Community Development".

INDUSTRIAL LEADERSHIP AS A FACTOR IN COMMUNITY
DEVELOPMENT

(An experiment in the application of Scientific Management to an
Industrial community in Texas.)

C. L. POOL

Gen. Mgr., Sherman Overall Mfg. Co., Sherman, Texas

The value of constructive leadership in industry has already been recognized as being just as essential to the progress of industry, and to the very existence of industry, as any other one element. Modern competition has decreed the fate of institutions trying to operate without constructive leadership. The buying public is fast passing the sentence upon

such inefficient and improperly organized institutions. And the three active elements of industry, Men, Money and Machinery must be welded together by constructive leadership if the three expect to work together in harmony for any great length of time.

Now, if efficient management is a necessity for the individual plant, why is it not just as necessary to a community of industrial plants in helping solve the problems that manufacturers are facing today? And since the problems of the community are almost, if not, identical with those of the larger plants, why should not the community of manufacturers organize to attack these problems as a whole just as the large manufacturer organizes his departments to meet them? And why cannot a community move forward as a unit toward a certain goal, just as a manufacturing organization must move forward? Why should it not be more necessary to raise the morale of the whole community than of just one plant? And why should not team work accomplish results in the community as well as in the industrial plant?

There has never been a time when it was more necessary to raise the morale of industry and to enlist the team work of every organization for constructive leadership, whether it is to be in our industries, politics, in labor matters, business, education or religion. The world is demanding a higher standard and a more constructive program.

The manufacturers and the employees today are being more forcibly impressed with the fact that the public must be considered, and with the realization that all are directly affected by what the manufacturers or the employees do, or leave undone. They are all three being brought to realize under the present conditions that the co-operation of all is necessary for the immediate success of each, and for the ultimate progress of the community and the nation.

But what does effective Industrial Leadership accomplish for the manufacturer, for the employee, and for the community? Just what are the relations between the three?

I. FOR THE MANUFACTURERS EFFECTIVE INDUSTRIAL LEADERSHIP—

- A. Cheapens the cost of production.
- B. Eliminates labor troubles.
- C. Increases output without increasing investment.
- D. Improves quality of product.
- E. Insures prompt delivery.
- A. Cheaper cost of production means—
 - a. Greater profits as a whole and a lower cost per unit, which brings—

1. Greater Business stability, because a lower selling price permits a wider market to be covered, doing away with the effects of local business depressions—
 2. Fewer shutdowns. Lower cost allows the factories to run at a profit long after competitors have shut down to avoid loss.
 - B. The elimination of labor troubles results in avoiding expense of—
 - a. Shutdowns from strikes and lockouts.
 - b. Loss of property and possible life.
 - c. Ill feeling on the part of the workmen.
 - C. An increase of output without increase of investment means—
 - a. Greater total profits—more units to sell.
 - b. No necessity for raising more capital.
 - c. Slight change in overhead expense.
 - D. An improved quality of product—
 - a. Decreases complaints and consequent loss of business.
 - b. Facilitates sales.
 - c. Increases demand.
 - E. Prompt deliveries means—
 - a. Satisfied customers.
 - b. Increased business through reputation for reliability.
- II. FOR THE EMPLOYEE EFFECTIVE INDUSTRIAL LEADERSHIP MEANS—
- A. Higher pay.
 - B. Steady employment.
 - C. Less fatigue.
 - D. Better satisfaction in work.
 - E. Education leading to better and higher ideals.
- III. TO THE COMMUNITY EFFECTIVE INDUSTRIAL LEADERSHIP MEANS—
- A. Better citizens.
 - B. Absence of strikes.
 - C. Steady flow of money from without.
 - D. Less hard times.

The manufacturers of Sherman believe that the greatest progress can be made by cooperation and team work in solving their common problems. They also believe that effective Industrial leadership can be applied to community problems with greater success when labor, capital, and the public are considered in the light of a single corporation where stockholders

are all interested in the success of the undertaking, than if it is applied here and there in individual plants. And our experience of the last two years has proven this.

Sherman, Texas, which is the seat of what might be termed this "Social Experiment" is a town of about fifteen or sixteen thousand people just south of the Oklahoma line, and sixty-five miles north of Dallas, Texas. It has some fifteen or twenty manufacturing plants of various sizes. The articles manufactured vary considerably—flour, cotton piece goods, cotton oil compounds, mattresses, cigars, cotton gin accessories, overalls, shirts, candies, machine parts, soaps, etc. Comparatively few of its people are of foreign birth, and all are English speaking. On the whole I believe that the workmen are above the average from the standpoint of education and intelligence, as well from the standpoint of right thinking and fair mindedness. The employers are open-minded, believe in fairness, and are willing to meet the employees half way, and the employees in turn have met us at least half way.

After the world war, the manufacturers realized that we were to have reconstruction problems as difficult, if not more so, than the problems during the war, especially from a competitive standpoint, and that the time was rapidly approaching when every manufacturer would have to get his production on a most efficient basis. Again, practically every manufacturer had been actively connected with the different kinds of war work, and had observed how much had been accomplished by the cooperation between labor, capital and the community and the ease with which results were obtained from such a spirit of team-work. Why could not this kind of team-work be carried out to help meet the peace time problems?

Realizing this, and to insure the greatest amount of cooperation from every organization, Sherman has organized a community Council and in this council sits, not a representative, but the presidents of different community organizations which have for their object the betterment of social conditions. Among the members of this council are the president of the Chamber of Commerce, Young Men's Christian Association, The American Legion, The Society of Industrial Engineers, The Red Cross, The Women's Civic League, The Pastors' Association, and the City Manager. Every one of these organizations named are accomplishing something for the betterment of the Sherman Industrial Conditions.

In carrying out this work, the Texas Chapter of The Society of Industrial Engineers has been endeavoring to carry its part of the load in the community program in cooperation with other existing organizations. We are not trying to make the S. I. E. a manufacturers' organization, for we are not—nor is it in any sense a manufacturers' association—but we are try-

ing to carry out in our work the ideals established by the national organization.

Sherman has a live Chamber of Commerce that took care of the general Chamber of Commerce problems, but that did not accomplish just what we needed toward industrial development. We felt that we should have an organization that would help develop the idea of constructive leadership and scientific management in the different organizations and a plan for the promotion of greater harmony in the community and industries.

Some of the manufacturers were already attempting to apply constructive methods to their own organizations but the agitations and the wrong influence due to lack of proper relations and discontent from outside sources made progress difficult. This brought us to the realization in analyzing our problems that we could get greater results from the cooperation of all the manufacturers.

The executives and sub-executives saw the need for an organization that would bring them together for study and for round table discussions of industrial problems for the fundamental principles of manufacturing. We felt that this would give us a clearer vision and a better insight into the needs of our institutions. We could not see why a community should not operate as a single unit in shaping the life of the community in industrial leadership. To fail to do this would be just as inexcusable as for a large plant to try to apply constructive methods to one department or to educate against radicalism and allow the seeds of discontent to be sown in other departments without making the proper efforts to offset this. It is the same old story of the rotten apple. Again, some of the industries were too small or not sufficiently interested to go in for a constructive program individually, but could be interested in a plan that would bring all the manufacturers into it on a community basis. Consequently, when the opportunity to form a local chapter of The Society of Industrial Engineers presented itself, we felt that this was just the organization to help us accomplish just what we had in mind.

The nucleus was organized and the study of Scientific Management begun. After these meetings had been conducted for some time, and our membership had reached a sufficient number we applied for a charter. I want to add this in reference to our members that we have not in forming our organization, solicited any one for membership in the S. I. E., unless he was open-minded, active, and one whom we felt would take the proper interest in the work.

In beginning the work, the executives felt that the first work should be done among the executives themselves together with the sub-executives

in studying the fundamental principles of industrial leadership, so that we could discuss and analyze our problems in an intelligent way, and then apply the proper efficiency methods in our plants, individually or in a community way, as the needs demanded. The most important results of our meetings and discussions have been the inspiration that the members have gotten from each other's accomplishments and the increasing interest created.

In order to make the greatest possible progress and to do more intensive work, the S. I. E. rented a reading and lounging room and furnished a library of books on manufacturing, cost accounting, and production. Other books are being added rapidly. Various magazines on management are also available for members. It is our plan to fill in with other books until we have a library covering every phase of Industrial Engineering. This library is centrally located, and to insure the use of these books, the library has been placed next to the room where our semi-monthly meetings are held and the room serves as a gathering place before and after meetings. This is really more than a library for it gives our organization a home and helps tie the membership together. Now for our chapter committee work.

Committees have been appointed to work and carry on definite lines of activities which cover the whole community of manufacturers, and to carry out as large a program of activity as can be done in a cooperative way.

In recognition of the importance of the right attitude of the foremen and for their undivided cooperation in accomplishing the results hoped for, a committee was appointed to work out a plan for a foremen's training class. This the committee did, and they secured one of the manufacturers who had already carried out a course of foremen's training in his own organization to take charge of the class instruction and lectures. This class has been made into a permanent organization under the name of the Sherman Foremen's Association. It is not necessary to emphasize the fact before this audience that the foremen have a big part of the load to carry in a community plan, or that they are the men who can make or mar the work of the best executives, or that upon the foremen of the community there rests the great responsibility of gaining the right attitude of the workmen toward cooperation. The main feature of the meetings at the present time is a series of lessons or talks covering all the fundamental principles of foremanship, handling men, personal qualifications, and scientific management. Every subject of interest to the foremen will be taken up as the work progresses. This could have been done in the individual plants, but there again comes the advantage of the community plan by making one course do for all organizations. In addition the foremen are brought together and

have their round table discussions, raising any subject in which any of them are interested, and getting into real community spirit, which they would not do if they were to have their meetings in their own plants. The foremen have dinner meetings, the expense of which is paid by the manufacturers to whose organization each foreman belongs, and this plan puts the social element into the meetings and adds greatly to cementing the organization together.

Fifty foremen already belong to this organization and we expect others to come in later. The response and interest has been much better than was expected. Their meetings are held in the same building as are those of the S. I. E., but on different nights, and every foreman is not only permitted to use the library of the S. I. E., but is urged to do so.

Our ultimate plans are to gather, while the course is in progress, all the material and information possible bearing on foremanship, and to condense all that is practical into a foremen's manual. This is furnished to the foreman while the course is in progress so that they can have it for constant study and reference.

While the activities for the advancement of the executives and the foremen are being carried on, the employees and the workmen come in for due consideration under our committee plan. The executives and the foremen can not do it all. They must have the cooperation of the employees, and in turn, they must give the employees the necessary consideration and cooperation.

First, it is necessary for the employees to think straight as well as to feel right toward their employers and understand the true relations between employer and employee. They must understand the problems that they must meet to make a success in their industry. Consequently the committee on American Ideals was formed, and has carried on a campaign to accomplish all this, as well as to get the employees' cooperation and to gain his assistance in increasing the efficiency of production. Large bulletins and plant meetings have been used to accomplish this, and plans are being made to use even more effective methods as soon as practical. There is no intention to try to fool or mislead but only straight-forward statements and open and above-board plans are employed.

A great deal of pressure is being applied on thrift. There are several different forms which are being offered. One of the plants has a Christmas Saving Club in addition to other plans for thrift. Another institution is offering its preferred stock to its own or any other employees on a monthly payment plan. But the most popular plan is a cooperative building and loan association which sells stock for \$1.00 per share per month, and pays 8% per annum, compounded semi-annually. This is decidedly

the most popular of all. Most of the larger manufacturing plants are represented on the board of directors and the association is operated at such a minimum expense that practically all the earnings go back to the stock holders.

The original five hundred thousand dollars' worth of stock for which the company was incorporated has been sold and the second half of the million dollars to which the capital stock was recently raised has been selling rapidly, the balance being expected to be completely sold before the end of the year. This is the only organization that has continued to make loans through the present depression, which fact has helped to relieve the shortage of homes.

We are pushing this form of saving because—

- 1st. It pays the maximum dividends for a savings investment.
- 2nd. It is absolutely safe.
- 3rd. It enables the working men to borrow for buying or building at a reasonable rate.
- 4th. It can be withdrawn at any time desired.
- 5th. It keeps every dollar in it reinvested in the community.
- 6th. It decreases labor turnover by stabilizing labor, decreasing the shifting population by increasing the home owning portion of our employees.

A chairman on thrift has been appointed from the local chapter of the S. I. E., to organize a committee to promote the thrift plan in all industries. The personnel of this committee is composed of either foremen or employees, one from each of the different plants and each committeeman directs the thrift work in his organization.

Again, the manufacturers have felt that the loyal and faithful employees are entitled to more consideration than they have been given in the past and that these employees should have the proper protection in case of sickness or accidents other than those covered by regular compensation insurance. The feeling that it is not fair to leave employees to their own resources when they have rendered loyal and efficient service, led to the organization of a mutual health and accident insurance company to take care of this feature of the work without expense to the employee. The premiums are paid by the member companies monthly. The employers do not do this as a gratuity, but as additional compensation for loyalty and efficient service. The Insurance company is financed and governed by a board of directors from the different industries cooperating in this plan, who furnish the capital necessary to operate the company.

In our work we have not overlooked the value of keeping fit, both among the executives and employees. To this end the committee on ath-

letics is promoting every form of athletics that is practical. A volley ball league has been organized and in this both the employers and the employees play. Some of the plants have courts for their own organization, and inter-plant games have been played. The Y. M. C. A. has given this part of the work active cooperation and has rendered excellent service in training leaders, encouraging local plants to develop teams, and arranging games. Baseball and outside athletic contests of other kinds will follow as soon as the season permits. Plans are under way to put on a big field day for all the plants as a unit later in the year.

In our plans for industrial growth, we do not feel that we can overlook the necessity of supplying executive material to replace the executives of today as well as those needed by the greater extension of our industries. Solid and substantial growth of industries demands a constant supply of new material to draw from. One of the great difficulties that confronts our industries as well as those in other small cities and towns, is the finding and training of the right kind of younger executives so as to keep material coming into the business for its future development. It is almost impossible for smaller cities to recruit them from the larger cities while those from the smaller towns as a rule are not properly trained nor do they have sufficient ability. To overcome this we are planning to take advantage of Austin College, which is a prominent school in Sherman, having from four to six hundred boys each year from over the Southwest. The college has a curriculum of high standing but no school of Business Administration. We have already started a series of lectures by the Sherman Business Men in the college and the faculty is making an effort to begin a course in business training and manufacturing with the fall term. It is their intention to develop this as rapidly as possible into a course that will enable us to obtain young men with a good solid foundation for places in our plants. This will accomplish three things for us. It will enable us to keep the ablest of our home boys by giving them their opportunity at home. It will enable us to keep the ablest of the boys in the college from over the Southwest who have ability and ambition. And it will enable us to know these boys by keeping in touch with the school, and the boys, so that we can place them where they are best adapted and where they will have the greatest chance to make good. We want to place the right boy in the right place. The town that continually forces its home boys of ability to leave to get a fair chance to make good cannot hope to keep pace with progress. If they can make good elsewhere why can they not make good for our own industries?

In addition to our industrial training work, we have two other ideas which we hope to be able to accomplish in order to round out our plan for

the development of our industries. The first of these is to retain an industrial engineer for the community, to supervise the educational work, and to act in an advisory capacity for all the plants in the training of key men in the various industries to enable them to direct an individual constructive program so that the plants may reach the highest point of efficiency. This will be necessary as we increase the effectiveness of our present work and develop our organization in a more intensive way.

Our other plan is for establishing new industries on a more scientific basis and reducing the failures and reorganizations of new industries to a lower percentage. As soon as financial conditions justify, it is our intention to try it out.

The plan is to select industries that have possibilities in the Southwest and to develop local material as far as possible for the personnel of the institutions. In starting the new industry we feel that the safest plan under our scheme is to start small and then build to it. In supplying a man for the executive job, we want to pick a man who has the right ambition, aspirations, the proper amount of native ability, and one who has given the proper thought and study along the line of Industrial Leadership and, to a certain extent, Industrial Engineering.

We will supply him with a board of directors, each of whom has proven ability in one of the five fundamental principles of management—that is, a successful sales manager, a successful production manager, and one well-versed in advertising, another who thoroughly understands cost accounting, and an experienced financier. This board of directors should give the organization a standing that would induce the most conservative investor to put his money into the business. Such a board should give sufficient strength to help the executive in charge to make it a success, enabling him to eliminate some of the high cost of experience by keeping him from making costly mistakes at the expense of the business, and at the same time helping to develop the manager into a high class executive without years of slow progress, costly experience or perhaps bankruptcy, putting the business on a stable basis in a minimum amount of time.

As a problem in community development, we consider that this is one of the most important as there is scarcely a town in the Southwest that is without a monument in the form of an empty factory building erected to inefficiency and inability, and very few, if any, of the business men but have a few shares of worthless stock that keeps green in their memory the effort of some retired farmer or banker or merchant who thought that he was a manufacturer. The failure is usually attributed to labor conditions, unwise location or lack of capital rather than the real cause. They could not understand that manufacturing and industrial leadership is just as much

of a profession as are medicine, law, civil engineering, mechanical engineering, and the other professions. So our plan strikes at this greatest weakness in new organizations and surrounds them with experienced council that will give the executives the necessary reinforcements to overcome any obstacles that the new business might encounter, or to help foresee embarrassing situations before becoming too deeply involved.

So far I have mentioned only the work that the local chapter of the S. I. E. has been active in, but the value of the team work with other organizations with which we are working must not be overlooked. Community progress is measured by the active cooperation of the organizations that make up the community life. It depends upon the degree with which every one of these community organizations enters into the spirit of the game, and the extent to which they lend their active support.

There is no reason why local chapters of the S. I. E. should not take their places in the community and work hand in hand with other organizations, and every Chamber of Commerce should not only encourage but help in the organization of local chapters. There can be no grounds for rivalry or competition as their work is along different lines.

The Chamber of Commerce is carrying on several activities that mean a great deal for the betterment of Sherman's industrial condition. Two of the committees of the S. I. E. are appointed jointly with the Chamber of Commerce. These are the Thrift Committee and the committee on American Ideals. Both committees are members of each organization. We have found that the community work can be better accomplished by the active cooperation of both organizations; the feeling that the S. I. E. was trying to engage in the Chamber of Commerce activities has entirely disappeared, and there has been the finest spirit of active cooperation.

The Chamber of Commerce has been active in bettering the health conditions. As you probably know, practically every Southern community has more or less trouble with malaria and production is seriously affected where malaria is prevalent by keeping employees out a great part of the time or rendering them inefficient while trying to work. The health committee of the Chamber of Commerce set out to eliminate the malarial mosquito which carries and breeds the malarial germs. And this has been accomplished to a large degree.

The Chamber of Commerce has organized a Sales Managers Association, composed of the Sales Managers of most of the institutions. These sales managers are doing the same thing in selling and distribution that the S. I. E. is doing with production. They believe that by the industries presenting a solid front in the selling field they can gain recognition more readily, working as a unit to impress the trade with the manufacturing import-

ance of Sherman, than they can by each manufacturer working along in a different way. They believe that the community team-work can be used in accomplishing results in selling just as in manufacturing. This does not mean that it is merely a boosting proposition but that the one big idea behind it all must be carried out fully and that is:—"Make Sherman Products Make Good," which is the only real foundation for accomplishing permanent results.

In the health work, the manufacturers have the active cooperation of the community nurse of the Red Cross, who gives her time where needed in the homes of the working people or any one else who may need help. Where plants have their own nurse she cooperates with them in every way possible.

The Y. M. C. A. has given the movement its active support. The Y. M. C. A. officers have been very helpful in developing the athletic program, in conducting classes in training leaders for plants, and in permitting the use of the gymnasium for the inter-plant games. The Y. M. C. A. building is used as a meeting place for all activities, and furnishes the meals for our dinner meetings at cost.

Again, the Y. M. C. A. in connection with the pastors' association has furnished speakers and held noon meetings in different plants. And there can be little doubt that these meetings have accomplished a great deal of good, and they have met with hearty response from the employee as well as the employer.

You will probably wonder what part a Pastors' Association could play in a community plan. The Golden Rule has become a recognized necessity in modern industry and if it has been recognized as of such importance in industry, why should this not lead us to think on a little further? There can be no doubt but that the applied teachings of Christianity must play a big role in stabilizing the industrial as well as some of our other abnormal conditions in this country, because Christianity is teaching the very principles of right thinking and right living that we, as well as our workers, should have as a proper foundation for all our actions. The necessity for these principles has been more clearly emphasized since the effort of the Soviet of Russia to stamp out Christianity in every form and to replace it with chaos, viciousness, radicalism, anarchy, serious strikes and lawlessness are not to be found in communities or cities of strong religious influence. Just two questions I will let you answer for yourself. Did you ever hear of a radical being a regular church attendant? Did you ever hear of workers being oppressed in a town or city of strong religious influence? Give me the man with the principles of right thinking and right living and who sincerely tries to live according to the teachings of Christianity, and I will

show you the kind of manager or employee that is forming the foundation of the new industrial era.

One of the most important things that has been done by the City Commissioners and City Manager was the employment of Mr. Kessler of Kansas City to plan for the future growth and activities of the city of Sherman. At that time Sherman was the smallest town in the United States that had undertaken to employ Mr. Kessler. A city's growth and accomplishments needs planning just as much as do its industries. This has already resulted in the elimination of some of our negro shanty districts, replacing them with recreational parks and athletic grounds. It has effected the turning of one of the most disagreeable and dirty sections into one of the most beautiful places in the city. An industrial district has been included in the plan which will take care of the future industrial growth, and when this is carried out, it will give us an ideal manufacturing section.

The Women's Civic League has been very active in supplying and improving play ground equipment for the children in all city school grounds and parks. One of the greatest accomplishments of this organization has been the establishment and operation of a day nursery and kindergarden for the benefit of mothers employed in the different industries and elsewhere. Most of the money for the nursery is furnished by the manufacturers but a committee from the Civic League supervises and directs it. It has been in operation for three years and has been a success, especially from the standpoint of aiding mothers to work and make their families a living, when without the nursery, they would probably be on charity.

Just how much all of this has accomplished in results for Sherman, I cannot say, I can give only a few facts as to conditions, and results and say that we feel repaid for the effort that we have already put forth. According to the Government census, Sherman's per capita production is four times that of any other city in Texas except Dallas, and it is twice as much as that of Dallas. Again, Sherman has a much larger capacity than it has ever had and it is still increasing.

We have had only one strike since the war in any of the industrial plants, and it was of little consequence. I believe that in the majority of the plants the best feeling exists between the management and the men. Since the slump came last July, three of the largest plants have continued running with full force and on full time and none of the others have been closed down completely. All of them have run sufficiently to keep their organizations together and it has kept unemployment down to a minimum. We have no bread lines nor soup kitchens. No real suffering due to unemployment in the community has been reported.

In production, four of the eight largest institutions showed increased

sales of from 1% to 85% during the first three months of this year over the first three months of last. Taking these eight institutions, the average increase in units shipped over last year is about 9%.

In the last nine months, there has not been a business failure of any kind either retail or wholesale in the city.

The community that has industrial leadership applied to its industries, that has the proper team-work among them, and then, in turn, has real constructive leaders at the head of the individual institutions will find that the superior quality and cheaper production will enable them to stand out against competitors longer and to establish a larger trade territory than the community which expects every plant to fight its own battles.

As to the quality of Sherman products, I believe that investigation will bear me out that as a community the standard of quality is far above the average, and I say without fear of contradiction that, taking each separately and comparing with competitors of same lines, Sherman products will hold their own.

At present the industries are reaching out and covering new fields, as well as covering old ones more intensively. Five of the manufacturing plants are shipping goods to foreign countries and two more are planning to enter the export field in the near future.

We do not have for our goal the biggest manufacturing center in the Southwest, but the best. We want a community of real citizens for we believe that this will mean more to us as citizens than anything else. We believe that a community should be a place in which to live, and that the one which is really worth while to live in is the community composed of high class citizens.

Just as the community has its problems, the district or sections has either the same or similar problems, and likewise the state and ultimately the nation. So in reality the nation's problems depend upon the work done in the community, as the nation is made up of these communities, and supplied with workmen from them. The spirit that is bred in the communities will be the spirit of the nation.

There is no question but that both city, community, or district can and must handle their problems in a cooperative way to get the greatest results. As the trusts have been developed in France and Germany, so industrial betterment plans will find growing favor with our progress. Communities will be organized into districts for industrial cooperation, districts into states, and so on. Not only will this be done, in the way of promoting industrial leadership, but also in industrial development, as was proven during the recent slump. One of our local plants found that there was a demand for different products than they were prepared to make, but that there

was no near source of supply. Another plant thirty miles distant had little demand for their product but found it possible to turn its production to the product required by the first plant. As the result of working together, the finished product was on the market in less than three weeks, thus helping both organizations to meet new demands. This same method is going to be made a greater factor in solving of our inefficient methods of manufacturing and distribution in the future.

Our plan is but in keeping with the growing tendency of the times to a greater cooperation between industries and a greater cooperation between communities in the developing of a community vision, which vision is just as necessary to the community as to the individual if any progress is made. The industries of the United States are organized to fight for a greater and more extensive trade territory. The individual industries have discovered that they cannot move as rapidly into the world field by their individual efforts as they can by the united efforts of all the big industries. Likewise, the industries of a community cannot work individually if they expect to accomplish the greater results. This same truth applies to the development of the plant organizations of industrial leadership within the plants, because the community must move forward as a community and must have the spirit of progressive leadership applied to the community as a whole if it is to make a proper place for itself.

Our plan is not yet complete, but what plan in a progressive community is ever complete? Our plans grow with our community, if our plans are worth while. So far, nothing has developed to show that the plan would not be applicable to any progressive community. We are simply trying to apply to an industrial community what the pioneers of our cities applied to trading and agricultural centers when they were small enough for personal contact and cooperation.

We believe that the principles we are applying to the industrial community of Sherman, Texas, can be just as successfully applied to Philadelphia or to Milwaukee, or any large industrial community as were the principles of Franklin and Solomon Juneau when applied to them as trading centers. These men analyzed the conditions of their day and having determined the facts welded their community and their state into a whole for the good of the public.

That is constructive leadership. That is engineering. Now we have become industrial, and in Texas, we are simply applying industrial engineering to community development for the good of the public as a whole.

THE CHAIRMAN: There recently appeared before the desk of a New York editor a rather excitable young man who wanted to know what had happened to his manuscript. He said that it was some verse. The editor did not seem to be familiar with the manuscript and the man said that it was some blank verse upon which he had put a great deal of time and effort. "Oh," said the editor, "Miss Smith, will you please have the Accounting Department give this young man a blank check." (Laughter)

This editor was not Mr. Alford—there are no blanks connected with him—he had no pages devoid of helpfulness as editor of "Industrial Management", nor were there any barren spots in his work for The Federated American Engineering Societies, nor will there be any blank pages in his forthcoming magazine "Management Engineering". I know that we shall derive a great deal in listening to him tonight when he talks to us on "The Engineer in Industrial Leadership".

It gives me more than ordinary pleasure to introduce my brother editor, Mr. L. P. Alford.

"THE ENGINEER IN INDUSTRIAL LEADERSHIP"

L. P. ALFORD

Editor, Management Engineering

I cannot fail to feel at home when I am in any way associated with Thomas for we have many things in common. For instance, we respond to the same Christian name; we honor the same alma mater, and we occupy similar jobs.

It is a pleasure to be with you tonight, although at the close of the second day of a convention it seems as if there is not much left to present by way of constructive comment; and yet this topic, "Industrial Leadership" has tremendous possibilities, it is alive and has in it the power of growth. No leader would search for followers in a morgue, and this topic in no way resembles or reminds us of the hands of the physician who makes autopsies—it does not smell of the dead, because leadership is unquestionably looking into the future. If this were not so we would not need to discuss it.

In this discussion of leadership, Mr. Pool has presented to you the collective phase; with your permission I will develop that a little further.

Perhaps you are thinking that the engineer always has exerted leadership in industry and in some particulars that is true—he has been responsible for design and for construction—but only in a narrow sense has he been responsible for operation. Designing and constructing are rather transitory. A man can design in a corner alone, or can construct a machine

with his own hands or with a few helpers. It is an act that once done is accomplished. But in operation we are directing many men and women, and are concerned with something that is continuous, that goes on day after day. The engineer in construction has been an individualist; the engineer in operation must become a collectivist.

You have heard of The Federated American Engineering Society. In the formation of that great organization the engineer won a victory over himself. He has been charged, and only too truly charged, as being one who held himself aloof; who did not know how to mix; who did not enter into public affairs; who preferred to be in the shadows and out of the limelight. In other words, he has been pictured as the narrow specialist. A legislator in Washington once said that as a group engineers were simply incomprehensible. Nobody knew what they wanted and they did not exert themselves to gain any great object. But this picture was not entirely true.

The so-called Safety First movement was an engineering development, started, as we know, in the Middle West largely in connection with some of the steel industries. As its importance was recognized it began to surge through this country and was finally fixed by legislation. At the present moment only five states of the Union have no form of workmen's compensation law. So far as industry is concerned, the advantages of that movement have been tremendous.

A careful estimate for 1912 is that 35,000 workers were accidentally killed in American industries. The statistics for the year 1919 show that only 22,000 were killed, and the estimate for the year 1920, final statistics not being available, is only 20,000. A sharp, decreasing curve, a decrease of more than 40% is a collective achievement which had its inception and leadership from the engineering profession.

There is a sharp contrast to those figures when we turn to American highways. In 1912 a total of 35,000 men and women were killed on our highways, the figure being identical with the loss of life that year in American industry; in 1920 the loss was 100,000—nearly three times as many. So, seemingly, we can with all assurance believe that the engineer is reaching forward to a collective position in industry, and as he does so he will be able to accomplish immeasurable results.

What is the great point of leadership which American industry needs, and that, of course, means the American people? It is the coordination of industry. And what do we mean by that? We mean the knitting together, the directing of all the energies and activities of the entire industrial fabric of this country toward a common goal, which is the effective production of goods. What is involved in that? The energies of 10,000,000 workers—their physical and mental energies, their ideals and aspirations, and their

cultural aims. Behind them is a background of some 30,000,000 dependents. Further, it means the proper utilization of some seven or eight hundred million tons of fuel, and the production of a volume of goods represented, if we go back only 100 years, by the manual labor of some two billions of free men or three billions of slaves. Only 100 years ago there was used in civilized countries less than one man-power of energy to produce goods for each individual, for in any state you have the young and old who do not work, the disabled and ill, the lazy, and a certain number must always work to support the civilized state.

We are now applying in American industry the equivalent of 18 man-power for each individual, a truly tremendous increase. Beyond that, we are using the entire industrial equipment of all our great plants as well as the equipment used for transportation and also for communication.

As a very crude illustration, industry can be thought of as a felted fabric in which the fibers are accidentally woven together, producing an article of use, to be sure, but one of little strength, or beauty. In it are fewer qualities than we find in the woven fabric, where we have a beauty of design, inherent strength, and a wide field of usefulness—far different from what we find in the felted fabric. A felted fabric is all right for a man's hat but we would not attempt to use it for a suit of clothes.

What is the reason for coordination in industry? Seemingly these are the advantages: First, the maintenance and increase of the standard of American living, because our standard of living is based squarely on industry. Second, the preventing of the infinite suffering and misery which would come should our industry break down.

To think what that misery might be, glance at Russia and China. In Russia industry has broken down, and in China, which has never had any industry, we are told that men and women are now dying at the rate of 600 an hour. Anything of that kind must be forced off and kept away from this great nation of ours.

At this moment, our industrial problems are unusually vivid. In January The Federated Bureau of Employment told us there were something like 3,300,000 industrial workers idle in the United States.

As a part of the "out of work" problem is seasonal unemployment, an outstanding fact was brought out by a survey of the bituminous coal mining industries by the American Institute of Mining and Metallurgical Engineers, in which we were told that some 200,000 more men are engaged than were necessary, and that the average miner works but 180 days a year. A very aggravated case of seasonal employment!

Beyond all this comes a great group of problems centering around the losses due to strikes and lockouts.

Have we any reason to believe that the engineer is qualified to attack this great problem of coordination and solve it, beyond the fact that he is in a position now to work collectively? The qualifications possessed by engineers, as a whole, are: first, an intimate knowledge of industry; second, an objective and detached point of view; third, a dispassionate attitude; fourth, a willing and eager obedience to natural law; fifth, the power of measurement and analysis; sixth, following decisions arrived at from facts.

Admitting, if you will, that these qualifications are vital, the engineer in coordinating industry must make an attack upon waste.

The Super-Power survey is expected to show that something like 25,000,000 tons of coal are burned in the Atlantic area which might be saved, provided industrial plants would all use methods of burning coal which are equal to a reasonably good average. Or, on the basis of the entire country it is estimated that from 20 to 25 percent of all the coal burned in the country is wasted.

Mr. Emerson several years ago attempted to sum up in dollars and cents the enormous waste in industry and gave us a gross figure of \$232,000,000 a day. Just think of what that means over even a short period. Our national debt is some twenty-five or twenty-six billions of dollars. In four months we could pay off our national debt, provided we could eliminate the wastes in American industry; in a year we could save three times our national debt.

It is possible that you are thinking this problem is tremendous, and with that point of view I agree at once. It may be the greatest single problem that the human mind has ever attacked, but for that reason we do not dare to say that it is unsolvable.

Will you go back a little in imagination? On the walls of the National Portrait Gallery in London hangs an engraving of men of science living in 1806 and 1807. It is known as the Walker engraving and reproductions of it are very common in this country. Forty-six figures are shown, the men being represented as gathered together in the library of the Royal Philosophical Society. In that group are many of the men who laid down the principles and did the pioneer work that has given us industry. Imagine with me, when those men were gathered together, as represented in that engraving, that they should have looked forward into the years, as we are trying to look forward today, and said something like this: "In order that we may increase the standard of living it is necessary that we should discover means of production which are unknown today. It is necessary that 100 years hence 10,000,000 workers in industry shall produce as much as 2,000,000,000 workers could produce today, using our methods of the nineteenth century".

Imagine those men talking in that way and then realize that if they had talked that way they would have been but forecasting what is a reality tonight in America. Does not that illustration give us courage to believe that the leadership of the engineer will bring about the coordination of industry, and so help to make this nation strong. (Applause)

THE CHAIRMAN: Merely to mention the subject of the next address is to stimulate interest and alertness. The subject is "Methods of Determining a Fair Day's Work and a Fair Day's Pay", and the speaker is Mr. Chester B. Lord, Works Manager of the Advance-Rumely Company, Battle Creek, Michigan.

"AN HONEST DAY'S WORK AND AN HONEST DAY'S PAY"

CHESTER B. LORD

Works Manager, Advance-Rumely Company, Battle Creek, Mich.

Philosophy has become so intimate a part of industrial management that we are in danger of considering it an end of industry, instead of a means to an end. It seems to be a law that the more beneficent a thing is, when used for good, the more baneful it is when perverted, and the more dangerous to handle, and of all these, philosophy is the most dangerous. 'Tis but a step from virtue to vice; from truth to sophistry; from philosophy to sentiment; and Carlyle says, "There is nothing so barren as sentiment." Further, 'philosophy is conditioned by the mood of the thinker,' and seems to overtake one at or near the droop of the physical curve. Bulwer Lytton says somewhere that "Philosophy has become another name for mental quietude," and I believe he reads the signs wrong who thinks this a time for mental quietude. Thought does not yet rule the world and a universal struggle is being waged to ascertain whether 'directed action' or 'direct action' shall dominate. It is worse than idle to talk of equality and coordination; with or without our consent one must dominate, and the only voice we have is to determine the dominant.

The occasion for these thoughts is the statement made recently that "Labor should be rewarded according to its needs rather than to services rendered, and that profit was secondary; and for "Needs" I read "Desires." Such utterances are not only unwise, but dangerous and unbusinesslike. Scientific Management under that name fell into disrepute because we forgot the human equation, and now we have remedied that, let us not go to the other extreme and forget the profit. We are a nation of extremists: "Three generations from overalls to overalls," one generation ruling its family with a rod of iron, the next being ruled by it, our heads in the clouds,

our feet upon the ground, but not at one and the same time. So I am NOT going to treat this from a philosophic point of view but from a practical one, and that requires consideration of natural and artificial stimulants, and natural and artificial restraints.

First, let us fix our fundamentals, which in this case are the nature of our contracted relations, and of our obligations. I am always suspicious of the man that preaches that the interests of capital and labor are identical. Since the pyramids and before, men have preached that doctrine, and we are just as far from convincing the other side as we will be a thousand years from now. Some have preached it because it is an apt phrase and used by others; but a little thought will demonstrate that while those interests may be parallel, they are not identical, and while parallel lines touch, they do so only at infinity, and not only are they not identical, but we are endeavoring to prevent them from being so. The railroad unions gave their idea of common interests when they asked the government to turn the railroads over to them and they would share the profits. The workmen of Italy said, "If our interests are identical, the factories are as much our as yours, and it is our turn to run them." Let us not hypnotize ourselves with a sophistry. The only identity of interest is that each desires to do business with the other and derive mutual benefit.

The relations of employer and employee are those of buyer and seller and the law of supply and demand governs. "Caveat Emptor" (Let the purchaser beware) is still the watchword. No other relation can be maintained and each retain his self-respect, and so when we take our plea to the bar of public opinion let us first be sure our own hands are clean, and that contributory negligence be not the justification offered. Let us be sure that we are affording every facility and even convenience toward an honest day's work that is a distinct feature of the contract. One cannot give a boy dull tools and expect a man's work, neither can one artificially restrict output to increase prices and expect labor to give full measure. Meddling with the natural law of supply and demand is at the cost of destruction, and somehow, sometime, we must pay for the difference between things that are and as they should be.

Any criticism of value received is worthless unless it is founded upon the failure of only one party to the controversy to live up to an equitable code of ethics. We are the party of the first part, and any omission of facilities—whether through lack of care, lack of knowledge, or lack of interest—render null and void any responsibility on the part of the party of the second part. Eighty-five percent of manufacturing lies in direction; fifteen percent in execution. Are we doing our share? Are we familiar with the laws and processes that will make an efficient day's work possible

and necessary, or, as is usual, do we do ninety percent of the eighty-five and leave the rest to chance? An executive may not be more efficient than his subordinates, but his efficiency should lie in a different plane, and the last ten percent in his exclusive responsibility; otherwise there were no reason for him. Taylor laid down the axiom that 'Speed is a function of quality.' Did that suggest a study of kinetics and rhythm? He laid down the law that 'Rest must adequately balance exertion.' Was that a mandate to study the laws of rest and exertion, or merely read as one of his statements? But all these, gentlemen, affect the day's output, and the knowledge he has of them measures the executive. Taylor merely laid down the proven fundamentals. Hundreds of years from now men will discover new and improved methods of doing things based on the same ones we have today.

A study necessary to a knowledge of refrigeration is heat, and one necessary to a knowledge of work is fatigue. Refrigeration is absence of heat; work is absence of fatigue. Refrigeration and work are both negative. Heat and fatigue are positive. With my hand resting on a desk with the wrist strapped down, I can lift my finger indefinitely if I allow a sufficient interval of rest between, but if I do it continuously I soon find myself unable to lift it, and I also find that not only is my hand tired, but my whole body:—for while "The blood is the channel for food, it is also the path of poison," and fatigue is a definite toxin. An ergographic chart of the movement of my finger would first show a rise, then a flat, and lastly a gradual descent to zero, and roughly speaking, it would take twice as long for me to recover as it did to fatigue myself; the law being four hours exertion, eight hours rest; two hours exertion, two hours rest; one hour exertion, one half hour rest; which demonstrates that the more frequent the rest the shorter it is in relation to the exertion. Experiments also show that after voluntary contraction has reached zero it may be stimulated temporarily, which corresponds to training and will power in man. Incidentally, on the muscles of a live frog it is found that after electric stimulation is zero, a bath in salt water immediately renews its resiliency, which would seem to explain the exhilaration of a bath, particularly a salt one. There are two recognized types of fatigue, mental, or nervous, and physical. Just where the one ends and the other commences is hard to tell, but we know that mental fatigue is cumulative; and sometime, somewhere, somehow, we must—unless we were "brother to the ox"—break out, and the relaxation of standards today is a mental and moral holiday from the concentration of the war period.

The laws of fatigue have been used as an argument in favor of a shorter day and the elimination of bonus plans. We have heard much about the

ability of a man to do more work in eight hours than he could in ten, but they who advocate it have set no standard as to what ten hours' work should have been, and I fail to see how lopping off the last hours of a day could make the others more productive or restful, as it contradicts the law. The unexpressed thought they really had in their minds was that a man should go home in better condition and not be forced to go to bed right after he had read his paper in order to acquire sufficient rest for the morrow's task, for we use a little more than our allowance of oxygen during the day and store up an excess at night. But conditions are fast changing and not only have the hours decreased, but the labor has decreased, and the law is applicable to exertion not keeping occupied, and it is a law that tissues degenerate only when under stress.

A very creditable work on fatigue was written some years ago by a woman in collaboration with Louis Brandies, Justice of the Supreme Court. Initially it was written to show that the hours worked in clothing factories were too long. It was largely an argument for a shorter day, and one of the statements it formally made was this: "The normal heart with its regular rhythm of contraction and relaxation gains sufficient rest during every second to work for a life time; its total rest being to its total work as ten hours are to six in sixteen hours. Now, giving the worker the eight hours sleep he has sixteen for rest and work. It would seem that during the sixteen hours he should not have less rest than that of the heart,"—an argument for the six-hour day and pure sophistry. In the first place she ignores the fact that sleep is rest; in the second that the laws of fatigue apply to exertion not to merely keeping occupied. Furthermore, let us take her argument and apply it to the whole day as we should, and we find that as ten is to six in sixteen hours, so is fifteen to nine in twenty four hours, and so I will agree with the author that the work of the heart should be the measure of the exertion of the body in twenty four hours. There are two other factors that enter into the question of fatigue in its relation to the average man; one is the difference in individual ability to profit from training and experience—ability to find new and easier ways of doing things, a sense of rhythm, making every move count; the other—and to my mind equally important and one which makes life worth living, is the "joy in work." To one who possesses this in a degree, fatigue is practically unknown. His work is his pleasure and life is not spoiled by discontent and yearnings for the unattainable.

The ball bearing of exertion is rhythm, and to speak of it in connection with work makes it appear as though we were trying to set our labor operations to music and raise them to the dignity of a social function, but then it is only a few years since people poked fun at articles on Industrial Psy-

chology, and if we are to coerce or induce an efficient day's work we must do our share toward making it not only possible, but necessary, and that coercion must not be at the cost of labor but of methods. A man is capable of performing a certain amount of work inherent to his strength and abilities—plus the accumulated experience and wisdom applied by efficient management, and the wisdom and efficiency we display in inducing an efficient day's labor will determine the amount the worker is forced to produce. The capacity of Taylor's pig iron carrier was twelve and one-half tons plus Taylor's wisdom and knowledge.

Rhythm industrially speaking marks the difference between abrupt, unbalanced, and unnecessary movements, at improper levels and in uncomfortable positions, and orderly, uniform, sequential ones. It is a law of Kinetics that "The arc of a slow movement cannot lie in the same plane as the arc of a rapid one," and so a series of uncorrelated movements cannot be otherwise than inaccurate, wasteful, and fatiguing. It is not movement that tires, but abrupt starts, stops, and changes of speed; reciprocating motion is merely long period vibration and is destructive or fatiguing in proportion to its period, unless it is figure of eight reciprocation, when it becomes rhythm.

In some early experiments to introduce inductive rhythm we took some punch presses used for blanking small armature discs continuously. These presses ran at two hundred revolutions per minute and had a two inch stroke. The production of each of four presses averaged between 35000 and 40000 pieces per day, which meant that each man stood on one foot or rested his weight on one side on his stool and tripped a lever 35000 times per day moving his hands in synchronism. Is it to be wondered at if he spoiled a percentage of the blanks and incidentally dulled an expensive die each time, particularly when we consider that one cannot do two things at the same time unless one or the other be automatic? We took one of the presses and reduced the stroke to 3/4" which eliminated much of the noise and vibration and reduced the speed to one hundred revolutions. The result was that instead of an average of eighty to eighty-five blanks per minute we secured an average of ninety per minute with less wear and tear on both man and machinery, and the man was able to smile when his day's work was done because he moved his work in rhythm with the press and no longer had to trip it.

Our next experiment was with women. Simplifying operations for men is good management; doing it for women is that plus duty, but it pays its dividend just the same and I have always found that every sensible reform or experiment did pay a dividend and could in fact be taken as a criterion of its success. The drill press which we usually think of as the best

place for a girl had always been a source of worry because they are the most dangerous machine in the shop from a feminine point of view. True, we had the best of guards, but hair does not blow nor is it drawn in straight lines, and so perforce we gave considerable attention to drill presses. Aside from being the most dangerous, a drill press is the most fatiguing. The parts require more handling and the manipulation causes a strain largely on one set of muscles. Furthermore it is abrupt instead of rhythmic and in different planes and directions. Six sensitive presses were engaged in drilling operations of about the same size and character in steel. Three of these were changed so that the spindles reciprocated automatically and in synchronism, properly timed as to speeds at various parts of the operation, and curiously enough I notice now that the cycle of the operation coincides with the time of the heart action before mentioned, but in seconds instead of tenths of a second. The actual placing time was three seconds; the time of a cycle eight seconds, or seven per minute. The drill jig was fixed and it was only necessary to place the piece. This reduced the number and character of the necessary moves and when compared with the other girls on the same work, it did not appear that they were working at all, but once every eight seconds almost without a miss except for the hourly rest period, we got our piece, and with only the fatigue of position at the end of the day.

Meanwhile our schedule on certain articles had been so increased that the room available had to be used for the machinery necessary to the increase, and the room for inspection and assembly contracted as its necessity grew and became a problem. Our requirements were 10,000 complete assemblies in nine hours, and our preliminary estimate showed an assembly time of three minutes requiring 55 people besides several inspectors and stock handlers. Still further analysis demonstrated that if we could eliminate handling and inspection and reduce our operations to three seconds each, or in some cases the multiple thereof, we would have sufficient room. With this as a basis we began our process of elimination. Straight bench work was out of the question because of room necessary and the handling problem. Belts were out of the question because of room and layout, but something partaking of both were essential. Finally we determined to build a rotary table inside a fixed bench and were of course (or thought we were) limited in size by the distance from pillar to pillar. The revolving table served only to supply material which was fed to it and removed, from the center. It did not seem possible that one man could supply the hundred thousand parts required each day, and take away ten thousand finished assemblies, but he did and had time to spare. The stationary circular part was about 18 feet in diameter and accommodated 18 people, including inspectors and repair man. The rotary part revolved at a rate of 60 feet per

minute and was divided into sixteen duplicate stock holders, and a shelf for parts that would not go together. Nobody waited; if two pieces did not catch the threads properly or were tight, they were discarded and came to the repair man, and this shelf indicated the quality of the work and the inspection. The great virtue of the revolving table is that it is rhythmic, continuous, and any one can perform any operation at any time. No one waits upon someone else, although of course each has her operation; and notwithstanding our misgivings as to capacity we procured 15,000 and once 17,000 assemblies from this table in nine hours. These and many other things we did as our share toward inducing an honest day's work, in addition to paying an honest day's pay, and it paid interest. We did the same with our inspection of small parts, increased our output tenfold, and reduced the total energy necessary one half, all of which is casting bread upon the waters, as well as inducing an efficient day's work.

But strange to relate these are the very things that give the greatest weight to socialistic propaganda. Their argument is that every new process cheapens production, eliminates men, and increases the wealth of the manufacturer, but their wage remains stationary. They do not get the other side nor do those interested want them to, and we are going through a crisis that would amaze us could we read history fifty years hence, and if we are thinking men we cannot help wondering why all the dissatisfaction, and what is the remedy. The cause of course is apparent; the remedy and its application not quite so clear, but we can at least try. Why does a mother spank a child when it is crying for something? The first answer would be because she has lost her temper, which would probably be right; but she would not spank it even when she lost her temper unless experience had taught that it had a good effect, and that effect is to change the current of its thoughts. Now I have said before, or I am going to say again, that in the mass we are all children and respond largely to the treatment accorded children. We cannot administer spankings, but we can administer discipline that makes such things unnecessary and changes the current of thought to a healthy channel. External war as a cure for internal dissension is as old as statecraft: it diverts the mind. People are not becoming better educated since prohibition but they are thinking more and have no solid basis of fact upon which to base their thought.

The greatest asset of any manufacturing plant is discipline, but when anyone mentions it we immediately visualize driving, oppression, and cringing, and the American people in general resent discipline, at least for themselves. But discipline does not make a man subservient nor cause him to lose his independence—quite the contrary—it is the best substitute we know for initiative and executive ability. Discipline does not mean the execution

of orders received insofar as they may seem suitable, reasonable, or even possible. It means that one has grasped the full idea and takes every possible means of accomplishing it. One has the sense that the order given can and must be executed, which is what makes the professional soldier or sailor of any rank the superior of a civilian of equal parts, and always ready to take command of those who have no sense of discipline.

"Discipline enables a man to change his habits at will, which is the attribute of a strong man." Discipline dispels doubt and uncertainty in a subordinate. Furthermore, discipline tends to content and joy in work. The man under no discipline is like the spoiled child whom nothing satisfies either at home or at work, and I need not enlarge upon undisciplined children; we all know them and those same children are those who in later years declaim against discipline—something they have never known.

Discipline, industrially speaking, does not mean harsh rules; quite the contrary, as they are unnecessary but it does mean few rules properly observed. Restore discipline and you restore content. Enforce discipline and you increase your production. A lack of discipline argues either a misconception of the term, a timidity in regard to enforcing it, or a lack of appreciation of its effects. It is a law of compensation that what is worth having and holding is worth fighting for. "Liberty is not withheld from those determined to have it," neither is justice. It is also part of Nature's law that a thing should be at its best just before it begins to decay. Man is no exception to that rule and it is therefore to be expected that as the restful period approaches he should have a more beneficent outlook on life; be more blind to weakness; just a little more tolerant of the "persistency of the established;" a little more inclined to follow the "path of least resistance." All these, whether he will or not, are indicatives of waning virility, natural to his years. But these same things are pitiful in the young for they indicate either the same thing or timidity, which is again the same thing. 'Old men for council, young men for war' still stands good; and the war must be waged upon the parlor socialists, muckraking authors, commercial cubists, industrial futurists, and well-intentioned meddlers of every sort. It behooves us to be firm, to be master of our own home, and when it is time to go, let the epitaph be "He was strict, but....." rather than "He was a nice fellow, but....."

While thought does not yet rule the world, speech does because it is the medium of contact, and La Rue in his *Psychology of the Crowd* tells us that the action of a leaderless crowd, no matter what its constituents, is always destructive. At such times any forceful speaker can stampede them. For that reason the verdict of the majority, if given without considerable time for reflection, is usually wrong for the reason that the major-

ity of people, regardless of station, are not thinkers; and for some unfathomable reason we always take the wrong side; and we are seeing presumably responsible men preach the doctrine of limitation of output, equal ownership, and other fallacies. We have seen the hot blooded Italians seize the factories; we have seen the cold blooded English demand the nationalization of mines and industry; we have listened to the Plumb plan; we have seen the railroad unions seriously ask the Government to give them the railroads; we have heard the declaration that the courts were not to be trusted and that Labor would not recognize further injunctions; and we have also heard Congress asked to relieve labor bodies from the provision of any anti-trust or anti-boycott law. All these are straws, gentlemen, and it behooves us to stand fast and place none but red blooded men on guard; but let us be sure that our foundation is such that we can afford to stand fast and not have it slip from under us. As the American Machinist says, "Give a square deal—and demand one." We cannot give that which we do not receive without loss, and compromise is never just, never satisfactory, and never ending. Shivering is Nature's way of attempting to warm a cold body; compromising is man's way of attempting to warm cold feet.

I recently read a pamphlet entitled "Coming—The Six Hour Day." It is advertised in some of the labor papers and, as might be expected, has little to say regarding the six hour day but is as near treason as it can be and get by. It advocates restriction of output, elimination of capital, and seizure of plants—largely by inuendo of course. It does not quote any of the labor leaders in support of its contentions. It quotes Babson and prominent Industrial philosophers and at the end it says "Buy books of me and help spread information. The net profits are used to more widely advertise and circulate these pamphlets." All these things, gentlemen, affect a man's idea of an honest day's work, and what are we doing to offset them? We compromise with principle and confirm the workingman's conviction that he was right and that we were withholding something from him. If we are, let us beat him to it; if we are not, insist upon a square deal. Treat labor as a wise father does his children. Give them the comforts and education that you can afford, give them their share of what is coming to them while both are alive, but give them nothing that belongs to anyone else or that will wrong anyone. A child has little conception of ethics. He cries for what he wants. If crying obtains it he cries again. If he is given candy to stop his crying he still cries for the same thing, but it is candy he has in his mind. Some people walk the floor nights with their children; others sleep, and those walked with because they exercised their lungs are the same ones we compromise with in later years because

they **still** exercise their lungs. Treat the mass as children because the mass does not reason; but treat the individual as a man because he does.

It has been the custom to discuss labor matters with a lack of frankness. We have called violence the work of sympathizers and have declared that we had nothing against organized labor except that we wanted independent labor to have a chance also. We fooled nobody but ourselves, Labor least of all. What we really have resented and do resent is the "in-law" in business. When we marry a woman we object to marrying her relatives also and have them dictate the treatment of our family, to their telling our wife that they 'would not do so and so for any man' and 'why doesn't she make her husband give her a larger allowance, look what he spends on himself'; to tell her that 'she is working too hard, she should spend more time downtown'; that she would be foolish to have children or responsibilities because she might want to get a divorce; and "Isn't he mean that he would not take HER relatives into business with him?" and "Why doesn't she leave him, he'll be glad to get her back." One is not considered much of a man who tolerates such things, and he at last tells his wife to choose between his home or her relatives. "You can go and see them whenever you wish, you can use your money on them, but they can't come here and they cannot interfere in my family affairs." That is a parallel case with organized labor. Many of those higher up are keen business men and as honest as men go, but the petty bosses are dependent upon the suffrage of the working man and must hold the center of the stage. Some one has said, "We hate the rich for the acts of their servants," and we hate organized labor for the acts of its petty tyrants and grafters. The same class of men that were once the petty political bosses are now petty labor bosses. As a class they 'toil not, neither do they spin'; and just as his prototype brought discredit upon politics so has the petty leader brought discredit upon organized labor; and as we sow, so must we reap (or step aside) and so I favor the American plan. If, as they claim, it is a movement to crush the workman, the unions will come back stronger than ever. It is not oppression that causes revolutions, but irritation, and Capital is revolting. Let us try it out and see if the family is not more harmonious with the "in-laws" dwelling by themselves.

Organized Labor have it within their power to be the greatest force in the country and to make their interests truly parallel with the employer, but they have not yet seen this opportunity and surely will not embrace it as long as the petty bosses can prevent it. It is my belief that they must change or perish because such has been the case with every organization formed to benefit any class; when their mission was completed they either changed their object, became oppressive and were finally destroyed, or be-

came a beneficent organization. I consider their militant mission near its end because manufacturers in general are awake and doing more for the worker than their own organizations do. But there is another phase of this that both Capital and Labor have neglected and that is: Securing to workers the fruits of their labor. By that I mean seing that they are charged only a fair price for their food; clothing and rent, which means adding to their earning power. Manufacturers and wholesalers generally charge fair prices, but the retailer gouges whenever the opportunity offers, and it is, I contend, distinctly a function of the manufacturer to represent his men in these matters and any manufacturer who does not do so has no right to object to someone else doing it and cannot contend that he is giving an honest day's pay if it lies in his power to prevent unjust charges against it.

All these things—Discipline, Fatigue, Rhythm, Service, Example—influence the honest day's work; but the workman reading this statement would probably lose sight of the close relation of the two and would ask, "Why talk so much about the honest day's work—how about the honest day's pay?" and the only material definition I can give is that "An honest day's pay consists of a fair proportion of the net profits of a well managed industry; medical attendance; accident compensation, legal advice, and reasonable conveniences; all of which are a logical part of operating expenses; plus a fair proportion of any extraordinary prosperity that the worker is responsible for equally with the stockholder." Like the real expression behind the desire for a shorter day, the demands for more pay are largely a state of mind, brought on partly by the increasing expenses of a family who usually do not realize that buying is also a trade, and partly by the desire to leave his family free from want. That thought is with every man that loves his family. He has little or no life insurance, he may be paying for his house or furniture, and when he thinks of his debts he is frightened, particularly if he be getting old. John Smith in the bosom of his family is vastly different from John Smith, the striker; and sometime someone will work out a rational endowment method that will remove that fear.

Boiled down to the final analysis and fewest words, I think we can define the formulae for an Honest Day's Work as "Preparation plus Discipline," and an Honest Day's Pay as "Equivalent plus Service."

ADJOURNMENT

FRIDAY AFTERNOON SESSION

April 29, 1924

"PRACTICAL METHODS OF FATIGUE ELIMINATION"

Chairman: FRANK B. GILBRETH
Montclair, N. J.

THE CHAIRMAN: With your permission, I will herewith submit my report on the activities of the Committee for the Elimination of Unnecessary Fatigue.

CHAIRMAN'S REPORT

The first work of those who advocate and practice fatigue study is to arouse a general interest in this study, and especially in the elimination of Unnecessary Fatigue. The Committee of The Society of Industrial Engineers assigned to this work has succeeded in arousing such interest.

This Committee is international in its scope, and consists of members and non-members of the Society. There will soon be a hundred members. The number is not limited. The Committee aims to consist of members from every line of activity that can profitably co-operate, either in the theory or the practice of fatigue elimination.

The personnel of our Committee is interesting. We have research workers in medicine, in psychology, in physiology and in psychiatry; economists and statisticians; representatives of the Department of Labor, national and state; of personnel work; of the American Posture League; educators; representatives of sister Societies; an expert in visual education who has also had many years experience in the army and as Director of a famous museum; editors; writers, and an advertising expert. It is scarcely necessary, today, to say that we have women as well as men members of the Committee. Two of our as yet small number of foreign members are women.

Being a Committee of a Society of Engineers, a larger number of our members are engineers than belong to any other profession. Some are members of the Engineering Foundation. Some are teachers of engineering—professors, deans, and in one case a president of a scientific college. Several are editors. The large majority of our engineering members are members of this Society, although the other great Engineering Societies are well represented. Many are engaged in consulting engineering, many belonging to the special group installing scientific management in various plants. Our foreign members represent many of the countries of Europe.

We have also a Canadian member, and there will be added within the next month several representatives from Asia.

The Committee has suffered a great loss during the last fortnight through the death of Mr. Lester G. French, Editor of the Journal of the American Society of Mechanical Engineers. Through his devoted work on the Journal, Mr. French has for years been an influence in engineering progress; and in arousing interest in the movement for the elimination of unnecessary fatigue, and his accessibility, cordiality and warm-heartedness have been such a factor in the hospitality of the Engineers Building that many of us feel that he can never completely be replaced. It should be the pleasure of this Committee to pass a resolution telling of our appreciation of the loss that we have sustained in the passing of Mr. French, and expressing our sympathy to his family.

As for the work that the Committee has accomplished, we can perhaps point to some tangible achievements. Several of our members have done work for fatigue on Fatigue Elimination Day, the first Monday in December. Professor Blessing held the first Fatigue Elimination Day at Swarthmore College, Pa., and his program has served as a stimulus and suggestion for others. The most continued and enduring work on Fatigue Elimination Day in England has been done by Professor Henry J. Spooner, also a member of our Committee, Director of the Polytechnic school of Engineering, London. Professor Spooner holds yearly a competition in which his students write essays on the subject of fatigue, and has not only aroused much interest, but sustained it and maintained his work ever since he started.

Mr. James F. Butterworth has done much pioneer work in disseminating information regarding Fatigue Elimination throughout the British Empire.

Our members have also written articles on Fatigue, conducted researches in Fatigue, and introduced Fatigue Elimination methods and devices in plants. In fact, in most cases the membership of the Committee has stood for real constructive accurate work in the elimination of fatigue.

The intangible results of the work of our Committee,—the by-products as we might say—have been far more far-reaching in their effects than the direct products. The subject of fatigue has become one of universal interest. More and more the literature and the advertising throughout the world shows thinking along the lines of Fatigue Elimination. Therefore, as a Committee, and as members of The Society of Industrial Engineers, we may congratulate ourselves that our campaign of arousing interest in fatigue has been successful and profitable. We must not, however, be satisfied with what has already been done, because the small field that we have

been able to cover is as nothing compared with the work that we must accomplish in this line.

The subject of the session today is PRACTICAL METHODS OF FATIGUE ELIMINATION. If we are to do worth while work, we must insist first of all that the work of our own Committee is practical. There are some very definite suggestions to be made along this line. First, the Committee must be enlarged. We should have at least one representative in every country of the world, preferably more, the number covering representatives in each field that directly affects fatigue. In this country we should have a representative in each section of this Society, and in each industry and in each trade. It is especially necessary that we have at once more representatives of allied societies, and some representatives of organized labor. It is suggested along these lines that at this meeting, each person present, whether a member of the Committee or not, hand in to the chairman a list of names of people in any country who would be appropriate members of this Committee. It is suggested that the name and address be given, also the line of life work in which the person suggested is an expert or is interested, and some suggestion of the type of work that he might best be asked to do.

While we are increasing our Committee, we must not fail to utilize the material that we have already enlisted. The membership of our Committee should be carefully studied, in order to see what possibilities we have, and the work of the Committee should be functionalized. At this early stage of the investigation of Fatigue, which is a comparatively new subject to many, it has not seemed practical to appoint sub-committees, but this subject is one open for discussion at today's meeting. The work of the Committee itself should certainly be functionalized, even though the members are not assigned to particular functions, because the field is so large, in fact, unlimited, and the membership so small, comparatively speaking, that each member may well handle many or all of the functions in his own vicinity and it is not the intention to limit activity merely to the function assigned. However, we as advocates of functional management must see that through utilizing the specialties of our membership, we can make the most profitable advances.

The Committee is remiss in failing to turn in to the Chairman reports or records of work accomplished or suggestions of possible work. This is probably due to the fact that all members of the Committee are busy with other important work. It should be possible, with a group as large as ours, covering a large field geographically and in the various kinds of world's work, to obtain at once a complete bibliography, a record of current happenings in the field of fatigue, and an enormous body of suggestions, yet

the chairman receives comparatively few from members of the Committee on the subject of Fatigue except those that are in reply to notices or other letters from him, but this will not deter him, for he promises to continue to push forward the movement for dissemination of information concerning the Elimination of Unnecessary Fatigue until it has been preached and practiced in all parts of this semi-civilized world.

Because of the nature of the Committee and great distance separating the members, it is impossible to hold many meetings at which a large percentage of the membership is present, nor is this necessary. Exchange of all data received will not be difficult. The Bulletin of The Society of Industrial Engineers acts as an admirable circulation medium for information and Mr. Dent, the business manager, is an interested and co-operative friend to the Fatigue Elimination Committee.

Fatigue Elimination Day should this current year be marked in some special way by each member of the Committee. Professor Spooner's paper as you will see, contains an admirable suggestion that each Fatigue Elimination Day be given a specific subject. We believe that the usefulness of data will be greater if it is so divided and grouped. The two papers which come from abroad are both on the subject of the Elimination of Noise, and Professor Spooner suggests that this topic be made the subject for Fatigue Elimination Day for 1921. We should be glad to have the action of the Committee on this suggestion.

A review of our Committee shows very plainly that we have ample material for speakers upon the subject of Fatigue. The committee should be canvassed, in order to discover who are willing to speak, and we shall serve as a sort of Speakers' Bureau for any interested in the subject.

It should be another duty of the Committee to stimulate interest in Fatigue by seeing that the subject is introduced on the platform of every convention of this and other Societies. The subject itself is so wide in its scope, since it concerns every member of the community and is equally important in the fields of production, selling, finance, schools and home life, that there is no excuse for not making Fatigue a feature at every meeting.

We might as well also consider the beginning of a permanent Fatigue Exhibit, which might be sent from one convention to another to arouse interest in the subject. The "Laziest man's table", which is shown for the first time in this Convention, is important only as a simple, easily made device, designed to make its user and observer think in terms of fatigue elimination. It is most important at this stage in our development that we emphasize the point that Fatigue Elimination affects every member of the Community, and that much of it is so simple that no training is required

to do it, and we should have a large number of simple, thought-stimulating exhibits available.

This Society should insist that Congress afford room in some of the unused buildings at Washington for a Fatigue Museum, which was started by one of the members of our Committee, the former head of the American Medical Museum, whose unappreciated work in the Army deserves Congressional recognition. I refer to Col. W. O. Owen, of the Medical Corps (retired). His work was well under way when he was retired, having reached the age limit in the Army, but not otherwise, and it then stopped because it was neither understood nor appreciated.

The Society of Industrial Engineers has offered a place in its exhibition, at each convention, to the Fatigue Committee. We have not availed ourselves of this space as we should. It is brought to the attention of the Committee that it is our duty to ask for and to utilize a far larger space at the next Convention, and to furnish Mr. Dent at once material for the Bulletin urging students, manufacturers and users of fatigue eliminating devices or methods to place them in this exhibition.

It is also a duty of this Committee to plan at this session for our next session at the next Convention of the Industrial Engineers. Definite suggestions for program and speakers should be made at this time. On the slips recently sent you with the notice of this meeting was a space for suggestion on interesting speakers. We desire to thank the few who filled in the spaces, and to assure them that their information will be utilized and is much appreciated. Concerning the program today, it is interesting to note that the two papers that have been sent in are from abroad—one from Professor Henry J. Spooner, of London, the other from Mr. J. S. Hooghiemstra, Delft, Holland, a friend of Professor Volmer, the eminent economist who is a member of our Committee and a pioneer worker in the great movement of dissemination of knowledge regarding Fatigue elimination, management and standardization that is taking place in Holland.

The leaders of the discussion, Mr. Segur and Mr. Shepard, represent two branches of our Committee—the engineer-installer and engineer-teacher. Mr. Segur has been interested in and has done exceptionally fine work in Fatigue Study and Motion Study for years. Professor Shepard is conducting a most interesting laboratory investigation in fatigue with his students. Others members of our Committee have also signified a willingness to talk, and will be called upon immediately after the discussion is opened.

Finally, as to plans for future development, all of our work so far has lain along the lines of arousing interest and surveying present practice and showing what has been actually done in fatigue elimination and its study. The next step in our development, for the entire process is carefully laid

out to the final super-standardization which should be the work of our Committee,—lies in gathering together material suitable to be incorporated into standards. Fatigue Elimination Standards and their exhibition where they will be available to all must be our next goal. **Standardization** is a word of paramount importance today, although not so much, in some instances, at least, in this country, at the present moment, as in the countries abroad, in spite of the fact that in total, this country has done the most. Two recent trips, including an intensive inquiry into conditions in four countries in Europe show that everywhere is coming a realization that the stability which is essential to progress will be secured quickest by standardizing first these things concerning which there is no dispute, and among these fatigue occupies the first place.

From our data already accumulated and from the papers presented to-day and succeeding papers, we should now proceed to make simple preliminary fatigue standards that may be submitted to our Committee, to our Society, to the engineering profession, and to the world at large to add to the comfort and happiness of all workers.

THE CHAIRMAN: I will also submit the two papers referred to, one by Professor Spooner, the other by Mr. Hooghiemstra.

"FATIGUE DUE TO NOISE, AND METHODS OF ELIMINATION"

PROF. HENRY J. SPOONER

Chartered Engineer

Director of The Polytechnic School of Engineering, London

Of all the recognized causes of non-muscular fatigue, it can be safely submitted that noise is the one that has received the least attention on the part of the Engineer, the Physicist, the Psychologist and the Psychiatrist.

As to the "man in the street," and the mental and manual workers generally: they—with rare exceptions—tacitly assume that noise is the unavoidable accompaniment of anything and everything in motion, and that in the nature of things it must be endured. Indeed, they have grown so accustomed to noisy road and rail traffic of all kinds, and to almost unbearable noise in many of our industrial activities that to no small extent they are practically unconscious of its injurious effects on their nervous system.

But the ear is a very complex and highly developed organ, through which the nervous system is easily affected and fatigued, and some industrial workers know by experience that a period spent in the midst of working machines and mechanical operations, causing deafening, and at times,

strident sounds of a wide range—with shocks to the auditory nerves,—produces a feeling of sensory fatigue. Now, although this fatigue attacks primarily a single organ, it little by little extends to the whole of the nervous system, leading in some cases in a greater degree than severe muscular fatigue. Indeed, nothing is really more fatiguing to some workers, particularly if they be highly strung,—or are neuresthenic from war services or conditions—than a noisy, unrestful, fussy atmosphere; and when it is realized that the human ear can be affected by vibrations of the air ranging from 1 to 40,000 a second, it can well be understood how injurious noises may be, and usually are, to the nervous system.

Fortunately, the large amount of attention that has been given to various aspects of industrial fatigue during the war has led some workers to realize how fatiguing work is when performed under noisy conditions. Indeed, at the recent Conferences on Industrial Fatigue, held at the Efficiency Exhibition in London, Dr. Stanley Kent, Director of the Department of Industrial Administration, College of Technology, Manchester, made a statement to the effect that “the deafening noise in the mills of the North will have to be reduced, as the workers are becoming conscious of its fatiguing effects.”

But the reduction of noise in our industrial works alone would not suffice to preserve normality in the nervous system of industrial workers and others, as even in sleep noise may be harmful. This aspect of the problem is aptly stated in Dr. Lillian Gilbreth's standard work “The Psychology of Management,” as follows:—“All unnecessary noise should be eliminated, and provision should be made, where possible, that the workers may enjoy their sleep or their rest hours in perfect quiet,—even though they are not disturbed enough to be waked up, every noise that is registered in the brain affects the body for it is now conceded that the body reflects every phase of mental activity.”

Now, if it be conceded that noise is injurious, and lowers the capacity for work of all affected by it, there is a clear case for the elimination—or at least reduction—of this form of human waste.

The general problem is not a simple one. However, an attempt may be made to classify the primary kinds of noise that should receive attention. They seem to come under the following heads:—

- 1. Road and Rail Traffic**

- (a) Noise due to the condition of the roads.
- (b) Noise due to the working and running of the vehicles.

- 2. Industrial Operations in Which Machinery is Used**

- (a) Noise due to the running of Prime Movers.
- (b) Noise due to Transmission Machinery.

- (c) Noise due to the working of Machine Tools.
- 3. **Industrial Operations in Which Machinery is Not Used.**
 - (a) Noise due to the use of Hammers, and other Impact Tools.
 - (b) Noise due to the Handling and Movement of Materials and work, etc.
- 4. **Streets and the Home**
 - (a) Noise due to Cab Whistles and Street Calls.
 - (b) Noise due to Music, etc., in Adjacent Houses and Flats.
 - (c) Noise due to Church Bells.

The writer is not aware of any case in any country in which the Engineer has been called upon to design and construct machinery, vehicles and roads, etc., from the standpoint of noise,—with the exception perhaps of engines for automobiles—but he knows of cases in England where the noise from Factories has been so intolerable to people living nearby that they have applied to the High Court for an Injunction, and an Engineer has been called in to deal with the nuisance. Indeed the writer has been professionally engaged on such work during the past two years, and has been successful in greatly reducing noises which to business people and others occupying premises adjacent to the works, reached a degree almost beyond endurance. Although he is not at liberty to discuss these cases, the writer may explain that they naturally led to his attention being focussed day by day on the causes of noises whenever and wherever he heard them, and on their possible treatment for reduction or elimination.

To assist in initiating a discussion, and in stimulating inquiry the following brief remarks—suggested by the writer's experience and observations—may be made on the above classification:—

1. The noise due to traffic in a principal street of a City—such as Cheapside, in the City of London—is so great that the offices along both sides of the street have to be fitted with double windows to make conversation and mental work possible; with the result that ventilation is bad all the year round, and in the summer the rooms are suffocatingly hot.

1a. Main roads, as ordinarily constructed, particularly the asphalt ones—soon get into a faulty condition, the heavy motor traffic causing ruts and holes, which have a damaging effect on the vehicles, and are the cause of much noise, particularly if the vehicles are badly worn. Rubber roads, if found to be practicable for heavy traffic, would for important City roads be a perfect solution of the problem; they would be practically noiseless, and would increase the life of all vehicles and of horses using them. Their cost, of course, would be great, but that would probably

represent a sound investment in the case of most of the principal intra mural roads.

A project is afoot in London to make a rubber road around Charing Cross Hospital, at a cost of something less than £10,000. Many natives and visitors have appreciated the noiselessness of the Savoy Courtyard, and the entrances to Claridge's Hotel, which are paved with rubber, the present price of which is 1s. 2d. a pound. But when the entrance to Euston Station was paved with rubber some 40 years ago, the price was probably over 12 shillings a pound. Freedom from noise is worth a great deal, but the question of durability under heavy traffic has to be decided; it is a matter of research and experiment.

1b. A high power, high grade motor car is almost noiseless on ordinary roads; on the other hand, badly worn ones, particularly of the heavy commercial type, create a terrible amount of noise, and this is accentuated when the exhaust cut-out is opened, but this should not be allowed except in the open country. Unskilled manipulation of the brakes and clutch of such vehicles—particularly on hills—is also a cause of much annoying noise. The noise due to the exhaust from steam locomotives, and the whistling for signalling purposes, is very annoying, particularly at night; but as a substitution of Electric Traction for Steam proceeds, this nuisance of course will decrease. There is also a great deal of preventable noise in shunting operations.

Even a contractors cart or wagon, moving at a walking pace, usually makes a great deal of annoying easily preventable noise, due to the backlash of the wheels hubs on the axle collars.

2a. In works situated near residential property the installation of prime movers of the explosion types should be avoided, as, unless they have abnormal foundations, objectional earth tremors are transmitted, often to considerable distances. Further, the exhausts of such engines are too often very ineffectively silenced. The almost noiseless electric motor for each main shaft, and for important machines, approaches the ideal, and can often be arranged to economically replace gas engines and steam engines; the current being supplied from a Central Power Station.

2b. Usually there is far too much preventable noise in all transmission machinery, particularly in high-speed belt drives. If a belt has a lap joint, or is jointed by some form of metallic fastener, it is sure to be noisy, and very noisy if there be play in

the shaft or spindle bearings. The ideal joint is one of a thickness uniform with that of the belting, such as the joint in Hendry's laminated belting, which gives an almost noiseless drive.

2c. Noise from the working of machine tools may be due to:—

- a. The use of a machine that is not the best for the job.
- b. The nature of the cutting action.
- c. Vibration set up by some unbalanced moving parts.

The above classification suggests the following remarks:—

A. At a recent Efficiency Exhibition held in London, a riveting machine was shown in action, operated by Wave Power; 2,400 blows a minute were delivered to the work, and the noise was appalling! This was an example of a remarkable invention wrongly applied. On the other hand, we have in the substitution of hydraulic riveting for hand riveting, an ideal example of how to advance from the standpoint of noise elimination—an operation that was so noisy that few boiler riveters escaped deafness by the time they reached middle age, converted into one that is practically noiseless, and also one that produces a perfect job. The substitution of pressure methods for impact ones should be made whenever practicable, in the cause of noise prevention.

B. The nature of the cutting action in some machines is such that the elimination of noise is impossible, only its reduction being practicable. We have in high-speed circular saws, and in wood planning machines, etc., the most striking examples of this class. The noise from circular saws rapidly increased with their diameter, so that their size should be a minimum for a given job. Wood planning machines and spindle—(moulding)—machines are notoriously noisy; as they set up far-reaching sound waves that have a most damaging effect on the nervous system of people even a good distance away from the machines. The character and intensity of the sound fluctuates considerably, and at times may reach a pitch that is unbearable to some people; and the mental torture is hardly relieved when the strident rolling hum tapers down for a time, as it is followed by dreadful expectancy on the part of the sufferer.

We have paid far too little attention to practical acoustics, and a rich reward awaits the genius who succeeds in suppressing the transmission of such noises as indeed, it also awaits the

genius who can invent some new and noiseless method of cutting and planing wood.

C. Apart from vibrations set up by faulty belts—already referred to—any revolving part out of balance causes that part to vibrate. For instance, violent vibrations are set up by an unbalanced spindle revolving some 20,000 times a minute even if it be out of balance a few grains only at a radius of $\frac{1}{2}$ inch from the axis. Grinding machines are often noisy due to vibrations set up by a grinding wheel that has not been balanced; and this can be understood when it is realized that if it is half an ounce out of balance at a radius of 3 inches a centrifugal force of 5 lbs. will be set up when the wheel revolves some 1,900 times a minute, and this may cause objectionable vibrations. Of course, the effects of such vibrations are greatly enhanced when there are worn bearings and the spindle or machine is mounted on something that acts as a sounding board. Fans are often very noisy for the same reasons.

3. Industrial Operations in Which Machinery is Not Used

(a) Noise due to the use of hammers and other impact tools used in the operations of the coppersmith, the metal motor body maker and others, can often be much reduced by the use of more rigid supports for the work.

(b) Noise due to the handling and transport of materials and work on trolleys in shops can often be materially reduced by the use of rubber tyres.

4. Streets, and the Home

(a) The noise due to cab whistles, and street calls of itinerant vendors of newspapers, and food stuffs, etc., is often very disturbing, and calls for attention. During the war, the use of cab whistles in London was prohibited, and is still prohibited, to the great relief of its citizens. Suitable signs—illuminated at night—are exposed at Hotels and Clubs, etc., when a cab is wanted.

(b) The quietude of the home is often disturbed by the activities in adjacent houses and flats of budding Paderewskis, Carusos and Melbas, and by the frolics of children. There is great scope for improved methods in building construction in the direction of sound proof floors and party-walls.

(c) The chiming of a good set of Church bells may be acceptable music to many, but the almost constant ringing and tolling of church bells, that some districts are troubled with,

may be a source of great annoyance to not a few; particularly to those whose minds must be kept clear. A case in point may be cited. Once at Warwick, Lord Chief Justice Campbell, irritated by the chimes of a neighbouring Church, shouted out, "Stop those bells"! suddenly adding, "unless it be for Divine Service, in which case God forbid."

(d) Many annoying noises lend themselves to easy treatment by the exercise of a little common sense: thus, the **crowing of cocks** in the night disturbs the rest of most people living near poultry yards, but those who have observed the habits of poultry will have noticed that cocks only crow when standing up with their necks stretched as far as possible upwards. So, if a coop be made of such a height that the bird can sleep comfortably on a perch some inches above the bottom, in the usual attitude of perching, but cannot stand upright; there can be no crowing until the bird is released from the coop.

Conclusion

In all civilized countries man has too long suffered from the tyranny of noise, and nothing short of rebellion against it is likely to ameliorate his lot. We may energise in forwarding the cause until we have enlisted the goodwill of a large body of industrialists and others, but even that would not improve matters much within a reasonable time, as the masses are **always** decades behind the times in matters relating to efficiency: or, as Burke aptly stated it "I have constantly observed, that the generality of people are fifty years at least behind in their politics."

Manufacturers and others should realize that noise prevention and reduction is a paying proposition, as there are many cases on record of material increases of output occurring when a change from noise to comparative quietness has been made, even when such changes have been made subject to duress.

Only active propaganda is likely to accelerate the movement and the writer ventures to suggest that special attention to noise prevention and elimination might advantageously be called for on the annual observance of Fatigue Elimination Day:* for noise in its cumulative effects, probably represents one of the most active causes of fatigue, and therefore one of our greatest wastes, as human resources are the foundation of a Nation's wealth. Indeed, we should bear in mind Beecher's dictum, that "little wastes in a great establishment constantly occurring, may defeat the energies of a mighty capital" and tackle the problem of noise prevention in the spirit of Lord Palmerston, who said, "Show me a practical improvement, and that improvement I will do my best to realize."

The writer ventures to suggest that Members of the Society should:—

1. Realize that noise means the lowering of human efficiency.
2. Endeavour to eliminate or reduce noise of any kind.
3. Encourage their subordinates and employees to offer suggestions relating to the elimination or reduction of noise.

*As there are so many aspects of the general problem of Fatigue Elimination, it might be desirable to invite particular attention to a single aspect year by year on "Fatigue Day"—such as Wasted Motion, Fatigue Reducing Devices, Lighting, Noise, etc., etc.

"THE IMPORTANCE OF SILENCE"

J. S. HOOGHIEMSTRA

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Noise During Work

It is especially America and England where people are diligently busy seeking for means by which the production may be raised to the advantage of both employer and employee. All kinds of questions are being studied, to which in most cases too little attention, if any, has been given. Among these a foremost place is taken by the question in what way Silence and Noise may influence the production.

It is a well-known fact, that a man who studies, likes to do so in quiet surroundings and that only very powerful individuals are able, so to absorb themselves in their work that the noises about them seem to make no impression on them any longer. The word "seem" is adequate in this connection, because very often it appears that e. g. a question put to them, does indeed, after a few minutes, lead to some answer or other, which then often makes a comic impression, because the act of reply was usually a half-conscious one. The fact, however, that some answer was given, indicates that **unconsciously energy** must have been spent for the hearing and **suppressing** of the stimulated sensation, so that these students might have given far greater attention to their work, if they had not been disturbed. In the overwhelming majority of cases everyone who must concentrate his attention on some subject or other, demands the greatest silence and it is even of great importance, that on looking up from one's work, the eye is not struck by fantastic shape or harsh colors. Concentration of perception on one single point is only possible, when the other organs cannot undergo a strong stimulus.

If the question is put, whether rest is universally recognized as an essential requirement for almost any kind of work, a negative answer must

be given. Taken as an example the modern office in which typists are at work, we find that people have seemingly got accustomed to the noise of the machines.

In America there are firms that have asked themselves the question, whether this noise has any influence on the quantity of work produced and they have come to the conclusion, that this indeed is the case. The comparatively great success of the noiseless typewriter used in thousands by a large firm, sufficiently proves the results obtained by the inquiry. Where as formerly it was generally accepted that the getting accustomed to noises was something secondary, people are nowadays inclined to think, that it takes trouble to learn not to hear the noises, and that after obtaining this custom, we must still spend energy to prevent secondary noises from obtruding themselves in the foreground of our consciousness. As a matter of fact the human machine wears down more strongly by the performing of this secondary work and it is a question of great importance to prevent this useless work. If we succeed in making the disturbing noises disappear, we want less energy for the work proper, so that on the one hand a greater production is reached, which must mean profit both to employer and employee and which on the other hand will give to the latter the great advantage of being less tired after his work. Hence he will—after the conclusion of his daily task—be better able to avail himself of the opportunity for recreation and do more for the further development of his mind.

It is not too bold to assert that up to now far too little attention has been paid to avoiding unnecessary noises.

There are many schools, where, with open windows, and often even with closed, noises from the neighbourhood are a continual nuisance, badly influencing the results of the teaching. The simple means of noisemuffling pavement and simultaneous recreation hours, when the schools are situated close to each other, is put into practice in far too few cases.

In the factories people have become so accustomed to the droning of the wheels, that they consider this as quite natural so that nobody pays any attention to the fact that machines should also be constructed so, as to cause the least possible noise.

In many cases this will be very difficult to attain, as e. g. in weaving-mills and boiler factories but the fact, that instead of the usual noisy typewriter a system has been invented, in which the beating of the letter against the paper has been substituted by an equally quick but noiseless pressure, shows that in other directions too, something might be done. We should not say, that we can get accustomed to noise, so that it is unnecessary to combat it. People should awake to the fact, that noise

always requires energy to suppress its distracting power, so that means should be sought to avoid all disturbing noises as much as possible.

Strictly speaking we should begin with the noises at home, which will disturb the mistress of the home in the performing of the indispensable but little appreciated household work. Care ought to be taken to build houses and streets in such a way as to deaden noises as much as possible and that no disturbance is experienced by the slamming of doors, of piano exercises and gramophone-performances, etc.

In the streets too, the noise might be considerably decreased by an adequate pavement, but especially by laying down rules to regulate the traffic by which the ringing of trambells and the honk of motors will be considerably diminished. Schools should be built in such a way as to insure the greatest possible quiet, so that the children's unsteady attention may be a little strengthened and also the attention of the staff be not unnecessarily diverted by which their difficult task is made even more strenuous.

In the factories proper attention should be paid to the question how a good construction and proper placing of the machines may contribute to ensuring a minimum of noise.

In England great attention has of late been paid to making the machines of aeroplanes noiseless, because it has been proved, that the enervating influence of flying must be partly attributed to the exertion wanted to prevent the enormous uproar as much as possible from penetrating people's consciousness.

There are of course plenty of other causes to make an airman nervous, but this need not be a reason not to try and eliminate one of the number. This is also necessary in the factories of ready-made clothing, where the whirring sound of the sewing-machines must be considered as a factor, which has a very unfavourable influence on the physical and mental condition of the sewing-girl.

The "I S H" Antilarum

A New Labor Saving Device

(Netherlandish invention, patents applied for)

One of the phenomena often indicated by the standing phrase "a sign of the times" is: increasing nervousness. The cause of this phenomenon are manifold. It is clear that the nervous system of modern man is not always proof against the rapid succession of impressions inseparable from the manner of living in our large cities. The quick incessant change and the intensity of some impressions overtax the brain. The subject is too extensive to be treated in detail here. But in connection with the kind of impressions which reach our senses, we will discuss the fatal phenomenon

against which no **universal** efficient remedy has been found. We mean the acoustic, or noise evil, a nuisance against which in several countries the so-called "anti-noise-societies" were started. These unions combat all unnecessary noise, the din, the tumultuous uproar of our towns, the brawling of gramophones, harmonium, and piano-abusers; in short these useful unions try to induce the Government, to put a stop to the production of troublesome noises, with which the coarser part of mankind sometimes reduce their more refined brethen to despair.

But how many cases lie outside the reach of any by-laws! Therefore technical science has made an attempt, however weak, and composed so-called "antifones." If namely the cause of a troublesome noise cannot be taken away, we can at least try to prevent that noise from reaching our inner auditory organs. Thus **Herbert Spencer** the famous philosopher and scientist wore earflaps in the evening, which he closed when the conversation bored him or when "music" distracted his thoughts. A better and simpler solution immediately suggesting itself is to put some cotton-wool in the ear. Many a man living in a jerry-built house, teased by noisy neighbours or by children training their lungs, has tried this remedy.

But the drawback of this primitive and non-aesthetic method, apart from hygienic objections, is that a small local irregularity in the density of the cotton-wool causes a troublesome pressure on the inside of the auditory canal, so that many people prefer the little apparatus, called antifones or sound-mufflers, various systems of which are to be had. Unlike cotton-wool, these need not be renewed either. Aurists however, often dissuade the use of these little instruments, convenient and simple though they may be, and rightly too.

For their aim is indeed to shut off the connection of the tympan with the outer air hermetically. This object is attained but at the same time the air between antifone and tympan is compressed. This latter subtle part of the auditory organ is thereby exposed to overpressure, which is most troublesome and injurious and may even become dangerous if the tympan is weak. And moreover these globulous antifones being made of ebonite, aluminum, celluloid or gallalite, have again the drawback mentioned above, that troublesome local pressure makes their use unbearable.

We have therefore tried to construct a modern type of antifone which satisfies hygienic, technical and acoustic requirements. An additional impetus was given to our efforts by the disturbance we experienced during intellectual work by loud conversations in our surroundings.

After careful experiments we have succeeded in constructing above mentioned antifone (trademark I S H, patents applied for in U. S. and abroad.)

For students and in general for all who perform intellectual work, antifones—if good ones!—are a real boon.

No less numerous in the category we already mentioned, namely those, who though not doing brainwork, are tormented by the brawling of children, by would-be “musical” performances or other insinuating noises in their neighbourhood. In conclusion we might mention commercial travellers in hotels or those who are compelled to attend prolonged meetings with often insignificant speakers, (meetings of borough councils, etc.) To artillery officers and to workmen employed in weaving mills and boiler factories or suchlike, good and comfortable antifones will also render great service, if not as preservers of the nervous system, yet certainly as preservers of good hearing.

THE CHAIRMAN: The first speaker on our program will be Professor George H. Shepard of Purdue University, Lafayette, Indiana.

FATIGUE TESTS

PROFESSOR GEORGE H. SHEPARD

Purdue University, Lafayette, Indiana

1. These tests are being made under my direction as a thesis for the degree of Bachelor of Science in Mechanical Engineering by Messrs.

C. S. Brandenburg,

W. B. Kurtz,

H. W. Pound,

E. H. Strubbe and

F. K. Van Arsdell,

to determine the minimum proportion of rest periods to total working hours on which workers on light-heavy muscular work can approximate their maximum output per day; and for other purposes.

2. Light-heavy muscular work is defined herein as work in which the muscular system is continually under load during the operation, such load not being heavy enough to produce a sensation of muscular strain, but the operation being repeated so many times that the workman becomes sensibly fatigued by the end of the day's work.

3. Individuals and industrial conditions vary so much that it is obviously impossible to obtain a general result as to the proportion of rest periods to total working hours, which will give maximum output, but we believe it to be possible to obtain a minimum proportion of rest-time to total working hours. Such a proportion of rest-time to total working hours would be the least on which industrial workers on light-heavy muscular

work could approximate their maximum output per day. Such a minimum, applied to a concrete industrial situation, would give the manager a starting point in the installation of rest periods for workers of this class, from which he could expect gradually to increase the amount of rest, until he found the figure which would give maximum out-put per day under his conditions. It is, of course, desirable that, if rest periods are introduced, a minimum figure should be used at first, in order that the management may not be obliged later to shorten or withdraw them.

4. The reasons why the tests herein reported are believed to give a minimum figure are:—

The worker is a young man, in vigorous health, an athlete in training, a wrestler of Purdue University in the one hundred and twenty four pound class, and undefeated except by the 'varsity champion of his class, so that he would be expected to have more endurance than the ordinary industrial worker:

During the rest periods, with a few exceptions, the worker was caused to lie down and relax completely; and such complete use of rest periods is rarely even approximated in industry:

The tests were run under favorable conditions as to quiet, temperature and humidity; at least conditions more favorable than commonly occur in industry.

A nine-hour run was made only once per week, and during the rest of the time the worker did only gymnasium exercise for his maintenance in athletic condition, an occasional wrestling match, and the mental work of a student; so that he would not be expected to show the cumulative fatigue of an industrial worker, who would be under load day after day.

5. The second purpose of this thesis was to determine, in this individual case, a cycle of work and rest which would give the maximum out-put per nine-hour day.

6. Laboratory tests have determined the general form of the fatigue curve.

It is obvious that, in order to obtain maximum output, rest should begin when the fatigued rate of performance equals the minimum rate of performance during the warming up period and should continue until the rested rate of performance will equal the initial rate of performance of the previous working period, provided the work gained by rest at least equals that lost by idleness during the rest period. The third purpose of this thesis is to test the soundness of this theory.

7. Josephine Goldmark, in her book "Fatigue and Efficiency", gives curves, showing the variation of out-put with time during a working day. The fourth purpose of this thesis is to test the correspondence of Gold-

mark's curves with the results obtained in this case and to draw such conclusions as possible.

8. The fifth purpose is to draw such incidental conclusions as cannot be foreseen.

9. The subject of study is a sophomore student in Civil Engineering, Mr. O. J. Broughton. Before any test runs were made, the University Physician examined him and reported him to be in excellent physical condition. He was requested to consider himself as one of the investigators; and we were fortunate in his physical fitness and still more in his ability to co-operate intelligently in the investigation.

10. All possible preliminary reading of the literature of the subject was done in advance. The principal result of this was to determine the length of experimental runs at nine-hours, as approximating the average working day in industry and as likely to give about the maximum possible output per working day.

11. We consider the question of most efficient working day to be unsettled. I hope to be able to obtain some experimental data on it later.

Principal Conditions on Test Runs.

12. As an operation for study, lifting weights on a selected and standardized gymnasium chest weight machine was selected, because the amount of work done could be easily measured and recorded with reasonable accuracy and because the operation is so simple that very little time had to be spent in preliminaries.

13. In order that the results might be determined by general fatigue of the whole body and not by some particular muscle, the operator was required to raise and lower the weights by walking away from and up to the machine, with his arms extended in front of him.

14. The following conditions were determined by time study as those of maximum output:—

The machine loaded to its maximum capacity, 15.3 pounds of dead weight on each side, giving a pull of 9 pounds at each handle.

The operator to walk facing the machine, with his arms extended in front of him instead of with his back to the machine.

The operator to finish both the up and down movement of the weights by a short movement of his arms, meanwhile reversing the movement of his body, so as to do away with a pause otherwise occurring at the end of each movement.

We were unable to control the temperature and humidity of the room, but recorded them in order that their effects might be noted, if possible. They will be considered in the final report. For the present, we have to report that up to April 9, 1921, the extremes of room temperature are 56 de-

degrees and 69.9 degrees, F., rather below the temperatures commonly accepted as most favorable to maximum performance and the extremes of relative humidity, 66.5% and 89.1%, rather above the range commonly accepted as most favorable to maximum performance. In other words, the air was somewhat too cold and damp for maximum efficiency.

The air of the room was kept in gentle motion by window ventilation.

In several preliminary runs the operator was allowed to work and rest as he wished. By averaging the periods of work and rest thus selected by him, the figures of 41.375 minutes for work and 7.625 minutes for rest were obtained.

Starting with 45 minutes work and 8 minutes rest, short preliminary runs were then made with controlled periods, to determine tentatively a cycle of work and rest which would give maximum output. This was done only in order to find a starting point for nine-hour runs, which are used as data in determining the final results, data from other runs being used merely as checks.

Up to this time the worker had had no efficiency reward. Before he started on the nine-hour runs he was given a bonus similar to the Emerson efficiency bonus in addition to his hourly rate. This was done in order to approximate industrial conditions and that the worker might feel at all times a pecuniary, as well as a scientific interest in delivering his maximum out-put.

The stop watch showed a considerable increase of the time of up and down movement of the weights, when the operator talked. Therefore all unnecessary conversation during working time was prohibited. On the other hand, the operator was encouraged to converse during the rest periods, in order to relieve the monotony of the work.

Results

The general results thus far are shown in the following table:

Date	Working Period Min.	Rest Period Min.	Average Foot-Pounds of work at handles of machine per hour.
3-26-21	25	8	93 570
3-12-21	30	8	102 730
3- 5-21	35	8	104 130
2-26-21 } 4- 2-21 }	40	8	103 525
4- 9-21	45	8	105 010
4-16-21	50	8	102 400
4-23-21	55	8	101 400

Conclusions

The difference of .58 per cent in output between 35 minutes and 40 minutes working periods, is within the probable error of the experiment; and is probably accidental. At the close of the day on 30 minute working periods, Mr. Broughton reported that he was very tired, more so than on any previous day, and that he thought he would be unable to repeat the day's work day after day. The decrease in average hourly out-put from 35 minute to 30 minute working periods is therefore probably real and 35 minute working periods with 8 minute rest periods, or 18.6 per cent of rest during working hours, is probably about the limit of profitable increase of rest periods in this case.

The reason for this seems to be that, with the working time so much shortened, in order to keep up the total out-put, the worker is forced to make very rapid bodily movements. When these become more rapid than their natural rhythm, the energy expended by the body in moving to a forced rhythm becomes very great.

There is no apparent reason for the decrease of the out-put, when the working period was increased from 45 minutes to 50 minutes, except the worker's fatigue. This is indicated by the successive records of numbers of up and down cycles of the weights during the 50 minute work periods of the day, which run:—801., 784., 779., 765., 768., 750., 752., 725., and 700. Mr. Broughton was evidently very tired at the end of the day's work, and so reported himself.

On April 23rd, the working period was increased to 55. minutes, with the rest period at 8. minutes as before. The resulting output of 101 400. foot pounds per hour is about one per cent less than with 50. minutes work and 8. minutes rest; and about 3. per cent less than the maximum which had occurred with 45. minutes work and 8. minutes rest. The successive records of numbers of up and down cycles of the weights during the 55. minute work periods are: 845., 835., 833., 824., 826., 822., 784. and 758., indicating accumulating fatigue. At 7.00 A. M., Mr. Broughton reported himself as having had plenty of sleep and feeling good. At the end of the day's work he reported himself very tired.

However, the decrease in output is not great enough, so that we can be sure that the maximum point has really been passed; and we propose to continue to increase the length of the working period, until we are sure that so doing is decreasing the output.

We propose next to keep constant that working period with which we secure maximum output and experiment by varying the rest period.

Our results thus far indicate that a worker on light-heavy muscular work and a nine-hour working day, can not give his maximum out-put, un-

less he rests at least 15.1 per cent of his time during working hours; but, as above noted, we shall have to make runs with still longer working periods, before we are sure that we have passed the point of maximum out-put.

Also it must be remembered that, in order to be sure that rest periods will increase production, the worker should have been interested by Efficiency Reward and other means to such an extent that he is seeking at all times to deliver his maximum out-put.

THE CHAIRMAN: I am going to ask Mr. Lord to say a few words to us on fatigue.

MR. CHESTER B. LORD (Battle Creek, Michigan): I rather doubt the practical value of the thing just explained by Professor Shepard because so much depends on the attitude of the mind of the worker toward the experiment.

When I was a young man, my favorite exercise was slinging a sledge-hammer to work off my energy. I found that in certain moods it was labor to sling that sledge-hammer and in other moods, when I could hum a little tune and get the proper rhythm and sling that sledge-hammer it was also necessary to stop me. I have known the superintendent of the plant to come around and say, "Lord, we don't expect people to work in the plant like that, stop it," and the question of fatigue didn't enter into it—I didn't know what it meant at that time. It was entirely the attitude of the mind.

If I call on somebody to help me in certain things, he may become elated and his control and reactions are mental rather than physical, so I wonder how much reaction is mental in these experiments, although the fatigue curves we have there (indicating) are Goldmark curves—the typical fatigue curves. Fatigue lies not so much in the amount of work we are doing as it does in the way we are doing that work.

As I said last night, the question of rhythm enters into it very largely, and that it looked as though we were trying to set our labor operations to music, and there is a great deal in that. Years ago I used to dream of having an all-woman factory, working to music, and a man who looks into the future has a great advantage over the man who is behind the time. But we are going to see that sometime.

Incidentally, at dinner last night Gilbreth made some broad claims, but there is one thing that he has not claimed, and that is that he set the slogan "Every little movement has a meaning all its own". I think he did that, as his specialty is cutting out, or eliminating, unbalanced movements, and I think that was the real object of the Volstead Act—I don't know.

Mr. Gilbreth substituted, "Drink to me only with thine eyes"—a little more music. (Laughter)

But the conditions under which the tests are conducted make a great deal of difference, and I, in my humble way, am trying to supplement what Mr. Gilbreth is doing, but doing it mechanically—approaching it from the mechanical end of it because I am a mechanic and represent the physical where he represents the mental. I am trying to introduce rhythm, and one of my hobbies is that a thing shall be done in a figure-eight movement when it is reciprocal, and in most cases I find that by changing the altitude of pieces, height of the chair or bench, or something of that kind, I am able to get a figure-eight reciprocation, rather than a reciprocation in the same plane, which is very fatiguing.

I thought at one time that I had discovered a third form of fatigue and I called that fatigue "repetitive fatigue". That doesn't mean anything in particular because all fatigue is more or less repetitive, but there is a fatigue that is applicable to both material and men. In the automobile industry they could take a spring and give it 100,000 compressions; possibly 200 compressions would break that spring if given all at once, but following the laws of fatigue, they may be able to give it four, five, six or an indefinite number of compressions, all of which, of course, follows the law of fatigue.

But this law of fatigue is just as applicable to sight—seeing the same thing all the time, seeing the same dirt in the corner of the stairs, going up the same stairs, setting down to the same machine, makes the worker tired and fatigued before he starts working.

That same law of fatigue applies to taste. I believe that indigestion is nothing but fatigue of certain nerves, caused by eating too much of the same thing.

But of course as I went further I found that that was not a new fatigue but a manifestation of the other, although it is something that is worth while studying.

To offset that in our factory we painted with white enamel all machines that women were employed upon, no matter what their nature, because it was bad enough to sit at a machine and watch it go up and down all day long without having to look at a machine that had to absorb light instead of one that radiated light.

Practically, I do real studying for standardization; mentally, I react against it, because sometime, somewhere, somehow we have to pay for standardization, which means, of course, concentration to a certain extent,

and the present wild days we are having, the present upheaval we are having is nothing but a mental and moral holiday from the concentration of the war period.

France as a nation has always been against standardization, even in large operations, and we are told that it saved her from the effects of an arrested civilization. That, of course, is taking a larger view and the question is whether we are going too far in our tendencies to standardize enough to arrest civilization. But be that as it may, I know of no nation in the world that manufacturers upon the scale that France does, that can reproduce the things that France does, either in art or in workmanship. We haven't that class of people in the United States to any great extent, and if we do find them we call them dreamers or "nuts" or some such term of that nature, simply because they are not susceptible to standardization, not susceptible to discipline and not susceptible to our code of ethics. Sometime we must pay for standardization.

The thing that we must settle is whether it is worth while going as far as we do in standardization, whether efficiency shall be the first or whether originality shall be the first. Those are things that we want to determine in trying these experiments.

THE CHAIRMAN: I know of no one better qualified to answer that than Mr. Alford. Mr. Alford, as you know, is starting a new magazine, with a man's size circulation, with a man's size number of editorial pages assured because it has a man's size number of advertising pages assured. Mr. Alford has stood for standardization for a very long time and I think that he will give us a fine talk.

MR. L. P. ALFORD (New York): I rather think what Mr. Lord has said really fuses into our belief as to what standardization should be and not necessarily as to what standardization is as we see it worked out in engineering and in industry.

In my own thinking I owe a great deal to Dr. Hutton, who for some years was secretary of the American Society of Mechanical Engineers. It was Dr. Hutton who pointed out to me the real basis for standardization when he insisted that any standard must be progressive and not ultimate. Once we think of a standard as something that is fixed for all time, we are checking progress, and if that were carried far enough, it would unquestionably mean an arrested civilization, as Mr. Lord pointed out. But if we think of a standard as merely a formulation of practice on the basis of the best that we know at the moment and then bring ourselves in the frame of mind so that we are perfectly willing to modify or change that standard as time goes on and as we learn better, it seems to me we have broken down this hampering effect of arrested development.

And so I think Dr. Hutton taught us truly when he said a worth-while standard was one in the progressive and never in the ultimate.

Perhaps there is just another sidelight on this, and that is the thought that what we are today and what we use today is the result of accumulated human experience, if you will, an accumulation of the experience of the human race, of the discoveries, of the knowledge and practice of the past.

Just a bit of a crude illustration is to ask this question—how does it happen that a woman with a household sewing machine can do much more work than can be done by hand? The ration for ordinary sewing, we are told, is about one to twenty, and at first thought, seemingly, we have discovered the violation of the principle that we are getting something for nothing because we know it has taken a number of labor hours to produce that sewing machine and yet a great number of hours can be saved with that sewing machine. Seemingly we realize that there has been an army of men and women who have contributed to the nation that sewing machine. We can think of the man who first dug ore or smelted it, those in the foundry, the moulder, and others who have contributed the manufacture of steel and its processes of hardening and tempering, men who worked in alloys, brass and bronze for the bars, and so on down, including the making of the thread from fibers, and so on. All those things are in a way a standardization, step by step, of the best that has been learned, and yet this extremely human experience is constantly increasing. No standard of that kind is fixed—it is fixed for a moment and that is what might be called an instantaneous standard.

I am going to tell a story which presents a contrast and possibly points a truth. The bit of the story goes something like this—two men died at the same time, one a business man and the other a man who worked in a shop. They passed through the Pearly Gates at the same time and stopped in front of the registration desk. The business man gave his name and his origin, the place he came from, and the working man did the same. The official in charge looked over the records and then said that seemingly neither one of them was registered for arrival on that day—possibly they had come to the wrong place, and he advised them to take the elevator to the lower regions, which they did.

Upon arriving in the lower regions they again approached the registration desk and again they were told that apparently they did not belong there and were advised to return to the upper regions. They went up again and approached the registration desk and the business man explained the situation and asked for a second search, and again the official went through the records and said there was nothing there, that neither of them was due that day.

Then a thought occurred to him and he said, "By the way, you came from such and such a place", addressing the business man, "Who's your physician?" "Dr. So and So". That gave him a clue and again he looked through the records and said, "Yes, I have discovered the solution of your difficulty—you arrived three years too soon according to the schedule, but Dr. So and So has a habit of sending his patients early."

Then he turned to the workman and said, "What city did you come from?" The man named one of our prominent industrial cities of the East. "What shop did you work in there?" And the man gave the name of the shop. That was also a clue and he looked through the records and said, "Yes, here it is. According to schedule you were due five years ago, you are delinquent. I think I know the reason—you have been working in a shop where Frank Gilbreth has eliminated fatigue". (Laughter and applause)

THE CHAIRMAN: Our next speaker will be Mr. Harrington Emerson.

MR. HARRINGTON EMERSON: I am going to suggest rather than state this afternoon.

It has been rather interesting to me in studying biology to find that the laws of biology hold good as far back as we can go. For instance, men discovered that the laws of heredity apply in the same way to plants as they do to animal life. Therefore, those laws of heredity were already established before life broke up into the two great divisions of plants and animals.

One of the great advantages of that is that we are now able to study the laws of heredity not upon human beings, which would be very slow and difficult, but we can study these laws with seeds, or particularly, with insects that live a short time and of which we can secure a great number so that in a single year you can secure twelve generations of insects. And not only that, you can secure them in a tremendous number of examples and you can control the matings. And so in a year you can work out problems of heredity that otherwise you would not be able to work out in twenty years if applied to human beings.

I think the same is true of fatigue. We are all heat engines; we are all descended from the same original source and what is true of one animal is true of another. I think if we had the experiments to prove it, we could prove that a mouse had strength exactly in proportion to the amount of food he digested, compared to a horse. I have tried to make comparisons between horses and men and I have found out that that holds good—that the strength of a man in proportion to the strength of a horse is in proportion to the weight of the man and the weight of the horse.

We heard Professor Shepard mention this young man who showed the eighteenth of a horse power, but in choosing his horse no doubt he chose an English dray horse, very heavy, and no doubt this man weighed about one-eighteenth of what the horse weighed.

Fortunately we have a very great number of examples, both as to human beings and as to animals, of long protracted work of the most intense kind that has been carried on for years and years and of which we have a tremendous number of records. I have found it exceedingly interesting to plod through those records, both as to men and animals.

For instance, the race horse—the trotting horse, and man running, can be compared, and nearly twenty years ago I published those curves and later on when I was making an investigation of that kind I discovered the same curves in the reports of the Carnegie Institute, I believe. I was rather indignant that the man who published the studies of his and given no credit to the similar curves which I had drawn up, being exactly like the curves he drew up, covering the same points, and I was feeling that I had not been dealt quite fairly with. While I didn't care much, it didn't seem to be quite ethical. Later on I found out that his investigations had anteceded mine two or three years and that I was the man who had failed to give credit instead of his having failed to give credit to me, but it simply shows that the data is there and anyone who wishes to take it up can find it and follow it out.

I shall give you a few suggestions and I make no pretenses as to accuracy because I did not take the time to work them out as I should like to, but they are very interesting as showing the relation of time and fatigue.

A man in one minute can do 87 times as much work as he can in ten seconds. I mean that he can work at the rate of 87% as much for ten seconds as he can for one second. If we go to the longer time and take a minute as the standard, a man can keep up for ten minutes 78% of the speed or of the work or of the exertion of the energy that he can keep up for one minute. If he works for one hour it is 63.8%; if he works for 8 hours it is practically 60%—59.2%; if he works for 12 hours it is 53.7%, and if he works for 40 hours continuously it is 42.6% of one minute and a man can work 40 hours continuously at 37% of the rate that he can work for ten seconds.

That was to me very astonishing—that it was possible to keep up over that long period of time, forty hours, at a rate of more than one-third of what he could do at maximum exertion for 10 seconds.

We can start in at ten minutes and compare the ten minutes to an hour and in an hour a man can do 81% of what he could do in 10 minutes; 75% for 8 hours; 68% for 12 hours and 53% for 40 hours.

We can jump to one hour and we find that as compared to the rate that the man can work at for one hour he can do for eight hours. That brings me to the contention that of all the absurdities I know of, the one of paying overtime—50% extra for overtime, is one of the greatest, one of the most foolish. Any workman who considers for a minute will say, "If you can pay me 50% more wages when I am tired, for work three or four hours after the eight hours' work is done, you must be cheating me during the eight hours that you are paying me the flat wages", and I see no escape whatever, from that conclusion. Either he is underpaid in the first period or he is overpaid in the second period. The fact is that in a well regulated plant you would have a rate for a man working one hour, and another rate if he worked two hours, and still another rate if he worked eight hours, and for the eight hour period you would have a lower rate than for one hour, and if you had a ten-hour rate you would have a lower rate than if the man worked eight hours. Indicating what it would be for twelve hours, compared to one hour, if he were receiving \$1.00 per hour he only ought to receive 84c if he worked twelve hours. He would always accomplish more in the twelve hours than he would in the eight or ten, but while he would be earning more in the day, he would be earning less per hour. The difference between eight hours and twelve hours is 8.8%. A man working 12 hours can do only a little over 90% as much per hour as he can working 8 hours; a man working 40 hours can only do 77% as much as a man working 12 hours.

It seems to me that you can take the records of the running horse or of the man on the bicycle or the man running and construct curves of that kind and find out very accurately what the falling off in human power is as you increase the time.

MR. FRED'K C. REIN (Philadelphia): Since the time of the Pittsburgh convention I have given considerable thought to the subject of fatigue elimination. I became convinced that all of us who were attempting to do work along industrial lines are doing something more or less toward the elimination of fatigue. On the other hand, I am also convinced that it is one of the most difficult subjects to sell. A few weeks ago at one of our S. I. E. meetings in Philadelphia we called on Colonel Hicks to meet with us at our dinner and tell us what was the matter with the industrial engineer. He brought forward some interesting things but one of the fundamental things he put over was that the average industrial engineer didn't know how to sell his work, and he cited the story of an architect who had come to him, telling him that he needed some help.

This architect said that there were seasons in the year when they were worked to death and when every man went home tired, and they put

on extra men. After a few months their flood of work would pass off and again they would find things slack and they would let the extra men go. That thing was done over and over again, and it occurred to him that there should be some way in which work could be found so as to spread it out more uniformly during the year and avoid these peaks and faitgue periods.

Colonel Hicks asked him to draw designs for fronts of a certain number of buildings and bring them to him. He did, and when he took the drawings of the buildings to Col. Hicks, the Colonel gave him a list of owners of vacant lots in Philadelphia and told him to get out after those people and tell them that they needed a building of such and such a kind, and point out the advantages to be had during a time when everybody was not pressing the men for service, during periods when mechanics and builders were eager to get work.

This architect became very enthusiastic about the plan. He met him a few months later and he hadn't done a thing, but he still had the plan and had lost part of his enthusiasm. He met the architect again last year, which was three years later and he informed him that there were two buildings erected on two of the vacant lots he had given him a list of; this architect still had his plan over in his desk drawer with the anticipation of sometime following out the suggestion of Colonel Hicks'.

I have told you that story because it is quite in keeping with a number of plans I have frequently suggested in the elimination of fatigue. Personally, I am going to make a confession. I don't know how to sell fatigue elimination except in minor ways, but I believe if Mr. Gilbreth would supply a leaflet to the S. I. E. in which he would show certain sizes of work benches and tables and indicate the most important things that might be suggested, that it would not be so difficult to sell the management and the program would be greatly advanced in a short time.

THE CHAIRMAN: That is a fine suggestion and there are already five or six such pamphlets in the proceedings of this society with the pictures and descriptions.

MR. DWIGHT T. FARNHAM: (St. Louis) What I want to say is an illustration of the method of selling fatigue elimination, apropos to what Mr. Rein just said.

In my own experience I had an example that would illustrate that fatigue elimination could be sold more readily if it was wrapped up with a definite saving, and quite generally faitgue elimination and the saved dollar can be wrapped up in the same package.

To get down to brass tacks on this thing, in this one instance, there were two men operating a dry-press brick machine. There were two men

pushing empty trucks up to that machine and when the men arrived they could push the empty car easily but after the car was filled with brick it was very heavy and these men could not start the car. The result was that the two men operating the machine had to shut down their machine, and of course there was lost output while overheard was going right on, and help start this car. We studied that thing for a while and it seemed a rather difficult matter to remedy because all the tracks, which went down several hundred feet, were set in concrete and had been very carefully laid out so that it was impossible to get a gradual rise. In order to meet that condition we put a hump in the track at the machine and by means of that hump it was possible to shove the back wheels of the car upon the incline, and it was very easy to push the front wheels over the hump when the car was empty and after it was loaded with brick one man could start the car.

As a result, all of the strain and fatigue that accompanied the starting of the car, the shutting down of the machine and also using two men on the car was changed so that the machine was no longer shut down and one man pushed the car. The saving, therefore, was the time of two men while the machine was shut down, the loss of output, and only one man was required to push the car, so that while the operation was going on the time of three men was saved and the time of one man on the car was saved all the time.

That is what I mean when I say that it is sometimes possible to show the saving in dollars and cents along with the elimination of fatigue. I believe that if we study long enough we can show that there is an economic saving in doing this work. (Applause)

MR. REIN: I quite agree with Mr. Farnham—I have done those things myself, but in looking over our problem of fatigue elimination in a large way we ought to have something that we can show to people and say, "Here it is". Now the industrial engineer has to figure it out all in dollars and cents before he has a chance to put it over.

THE CHAIRMAN: Mr. Rein's suggestion is exactly the contention that those of us who have been enthusiastic about this subject have always had.

We have the chair for a starter. The biggest single thing in fatigue elimination is some kind of a chair. It would astound you, perhaps, to know there are millions of people working in this country who are not allowed to sit down, even though they have no work to do, the boss retaining his ancient privilege based on if he pays them money he shall have the right to say whether or not they stand up", not knowing that it costs him money for that privilege.

This subject has been spoken of from the standpoint of making money ; it has been spoken of from the standpoint of standardization ; Professor Shepard has given us a fine story on the standpoint of not only arousing the interest in the subject in colleges but incidentally showing a method with which to proceed, and the results. But there are other standpoints, and one is the standpoint of Americanism, and if you make me work at a speed that makes me too tired and do not provide me with an opportunity to utilize my periods of unavoidable delay by resting, you will have difficulty in having me accept on faith your other statements regarding the good features of American Institutions.

If you go out into the factories as I do, and you do if you are an industrial engineer, you know it is a common thing to see women seventy year old working in a factory, waiting for this and that in the shape of materials and tools to be brought to them, and not allowed to sit down while they are waiting. That is what we are objecting to from every standpoint.

Let's hear of it from the standpoint of mechanical engineers. I have great pleasure in introducing Professor John J. Flather from Minnesota State University.

PROF. JOHN J. FLATHER (Minneapolis) : I cannot add anything of value to the discussion but may be able to give a sort of footnote that might be of interest.

I have just designed for the Medical Department of the University with which I am connected, a form of dynamotor, built from a bicycle, that will give us a record in foot pounds, and a fatigue testing machine for the Medical Department for the purpose, primarily of testing the heart action of children, particularly boys.

It is proposed, in connection with the dynamotor work which will be given in foot pounds, to connect an appartus so that a photographic reaction of the heart will be given which will portray what is going on in the heart of the individual, due to the muscular effort exerted.

Undoubtedly that will lead to a larger development of the same problem in connection with our Mechanical Department, where we shall add to this dynamotor a transmission feature so we can get an autographic record in foot pounds of work done, and that, with the photographic reaction of the heart taken by the Medical Department, offers a great opportunity in the question of fatigue, because you can get the various efforts exerted and the reaction obtained on the heart.

MR. WILLIAM LEFFINGWELL (New York) : I have always considered the subject of fatigue elimination not necessarily as a question of saving dollars but as a question of good management.

If we look back to the work that was done by the slaves previous to the Civil War and compare that work with the work that is done today by the free men, the men of intelligence, we find that the value of slavery was greatly overestimated; that it was possible to produce far more without slavery than with slavery.

It has been my experience that a satisfied worker produces more, and what's more important, makes a better citizen, and being a better citizen he raises the general standard of citizenship throughout the country.

I don't quite agree with Mr. Farnham that the only way to sell this thing is to say that you are going to tell the manufacturer that he is going to save a few dollars by it. I think that is rather a reflection on the good sense of the manufacturer. Of course that is true regarding some little two-by-four manufacturers—I mean two-by-four mentally—but it certainly is not true of the big manufacturers who have a broad viewpoint, and may have a broad viewpoint if they do not have a very large factory and I would still call them big manufacturers.

The thing that is most important in fatigue elimination is that it makes better citizens. We don't have to have an Uncle Tom's Cabin written about fatigue but we ought to have something written which would show the manufacturer how much better his workers should be, how much better the general standard of citizenship would be if these things were done.

Mr. Pool in the Production Meeting yesterday told us about a social experiment in Texas. I believe that some day some such social experiment is going to be made throughout this whole country, that people will wake up to the fact that a workman in order to produce the very best results must have the very highest quality of standardized equipment, must be taught the very best methods, and all unnecessary fatigue must be eliminated. Of course I don't mean by that that we must not get tired—everyone of us like to work until we do get tired, but we like to have every foot pound of energy that is exerted count for something.

MR. DWIGHT T. FARNHAM (St. Louis): I want to state that if I said the only way to introduce fatigue elimination was by the dollar way it was because I was frightened at being so close to Mr. Gilbreth because I know his feeling in regard to the extermination of men who have the intelligence below A and plus. I didn't mean to make any such statement, but if I did, I wish to apologize and make that correction in the notes. I merely wanted to say that that was one of the ways that would appeal to the men who have the lower nature—that nature where it is necessary to talk in dollars and cents.

THE CHAIRMAN: Our next speaker, Mr. A. B. Segur, is an in-

dustrial engineer who has done exceptionally fine work in motion study and micromotion study.

MR. A. B. SEGUR (Chicago): It seems to me as though we have before us one of the most important subjects that has yet come up in the entire convention. Mr. Gilbreth, as I have stated before, to my mind is perhaps the greatest man in motion study and fatigue elimination that has ever lived and I think that when he has been dead for about ten years we will appreciate him more than we do now.

I don't think that even Mr. Gilbreth with all his vision, realizes how great this subject really is. I know that I don't realize how big it is, and Mr. Emerson, who sees further than most of the rest of us in these things, I imagine probably sees a greater future in it than anyone else here.

The trouble with fatigue elimination and with problems of this kind generally, is that we are inclined very much to regard the job as a welfare job and it is generally turned over the attorney of the company or to the sister of the president or somebody like that to eliminate the fatigue throughout the factory, and then they get the house organ busy describing all the wonderful things the X. Y. Z. Company is doing—they want to advertise as far as they can without having to spend money to do the work. I may have a poor view of our manufacturers that way for the reason that I was engaged in the so-called welfare side of things, but if you want to get things to a basis where they are really done, they have to be translated into dollars and cents because the firm that does not look to the dollars and cents side of the ledger is going to lose out sooner or later, so the manufacturer must look to this side.

We have a machine that has one pin that does not have a great deal of strain. The pin is and must be fairly small, but I don't suppose that the strain on it at any one time exceeds ten pounds but the strain comes very rapidly; it's a shock and it strikes many, many times a minute. We have tried every kind of steel that we know about in that pin and we have yet to find a steel that will stand more than one month in that position because of the high shock—just a trip-hammer shock all the time that finally crystallizes the steel. We have come to realize that there is such a thing as fatigue in metals. So, when we are designing bridges and the structure of machines we prepare for the fatigue of the metal and prepare for the replacement of such pins as the one I referred to. But with our workmen we put up conditions which are uselessly fatiguing, sometimes, and then we make no provision whatever either for replacement or for cutting down the cause of that fatigue, and what is the result?

We come along on a high speed production for a while and then after John has worked overtime for one or two days on that sort of thing the

conditions aren't just right, time cards haven't come out, instruction cards were not gotten to him, and his mental capacities have been knocked out from him. John goes home, he is tired, almost sick and he wants to lie down and sleep. He has one or two things to do at home and the wife comes around to him with something she wants him to do and John begins to say things about that company that wouldn't be well if they appeared in print. The same thing occurs the next day, the next day, and then the agitator comes around and the first thing you know John is on the strike list when he should be the best employee you have.

A great many of the difficulties that we experience in industry can be traced to the fact that we haven't given sufficient attention to the mechanical side of the equipment that went into our plant. Designers spend most of their time and thought figuring how they can make a beautiful machine and will tell you that in ten years it will be running just as well, they will tell you about the bearings, but they can't tell you about the bearings in the mental capacity of the man running that machine. What difference does it make whether that machine runs ten or twenty years if out of that machine, due to the fact that the fatigue element has not been properly taken care of, comes the cost of the welfare of the workers? I would rather have a crude machine properly arranged for the welfare of the worker than to have the finest machine ever built which was not so arranged.

When the whole thing gets down to the question of fatigue, it comes down, finally, to the question of motion study. If you have the proper men on the job, it is not the question of the load the man lifts that has a whole lot to do with the fatigue. I have seen men handle 90, 100 and 200 pound weights and handle them all day long and be in pretty good shape at the end of the day. I used to know a negro at Pawtucket who used to handle bales of cotton—250 of them a day, and do it every day. The time requirement there was small and he was a slow mover, but the thing that makes for fatigue is the motions that the man has to go through and the unnatural positions of the body required in handling either the large or small load. There is just as much fatigue that can come to the strong man as to the weak man from being compelled to work on a table which is one-half or one inch too high or too low as there can come to the man handling heavy pieces.

Did you ever start to walk in an unnatural position and then try to straighten up to your natural position? You can't stand it for more than half an hour. If that is the case, how do you expect the worker to stand it for eight and ten hours? The trouble is that we are all "kidding" ourselves and we think we are saving money for the company by not putting

in the extra lift on the table or the chair, when, as a matter of fact, we are so cutting down our output that we are paying for that table or that chair in the reduced amount of output we are getting, about twice every week. And we go along "kidding" ourselves in the cost records every day. Those are the things that are serious.

I have seen on punch press operations in one plant, where I think equal accuracy was required, an operator who was turning out 15,000 pieces per day on one operation, a particularly bright operator. On a similar operation in another plant, where the table had been raised and where conditions had been made right for the operator, another operator, of foreign extraction, with not near the intelligence of the first operator, was turning out 96,000 pieces, handling them nearly every day. That 96,000 pieces of course was a high output but couldn't they have made several punch presses on that operation going on day in and day out for the difference between 15,000 and 96,000 pieces? But the first plant did not want to throw it away, but they were sacrificing the operator and also their profits every day.

You have seen all that happen. Take an average operation where you change it to one that is less fatiguing and nine times out of ten you will get the highest production per operator, because the whole thing comes back to a matter of ease of production.

One of the things that has to do with fatigue is the matter of the balance of the rhythm in the operation. Have you tried the stunt of patting your head and rubbing your stomach at the same time? It's an easy job. Did you ever think how much difference there was between the arms working in a horizontal plane and the legs working in a vertical plane? The legs and arms were designed for vertical and horizontal work, and yet I have seen some cases where they tried to shift the leg to a horizontal plane and the arm to a vertical plane.

(Motion pictures were shown and explained by Mr. Segur.)

MR. A. B. SEGUR: It wasn't my purpose in showing those two pictures of those two girls to convey the idea that anyone was going to come up here and learn how to put electric light plugs together, and if anyone goes away with the idea that they learned a clever method of building screw drivers or of putting electric light bulbs together, whatever time used in getting this picture together will have been wasted. The thing that I have been trying to get across is that fundamentally the most profitable thing you can do in your plant is to figure out how you can best arrange the job for your operators and cut down the fatigue of their motions.

The wisest dollars and cents policy is the most far-sighted welfare

policy in your plant, if you want to call it such, only please don't let's put it on the basis that we are going to try to put it on the basis of mankind—let's come right out and say that we are going to make money out of it and are going to do it by increasing the output in the plant. If we can look at it from that basis and study our job from the fundamentals that the hands must work in harmony, that the horizontal plane is more beneficial for the arms than vertical plane, and that the vertical plane is more beneficial for the legs than the horizontal plane, that it is the shock in the operation and not the quantity of work done that makes for fatigue, that it is not the load handled but the impact of that load that breaks up metals and breaks up the human body, we can cut down the fatigue in our jobs and increase the profit of our firm. Let us by benefiting the employee and by scrapping the poor machinery benefit the company ten-to-one and enhance the reputation of the engineer both to his client and the employees, who must, after all, bear the brunt of any mistakes the management may make, and who get the benefit of the improvement the engineer may make.

THE CHAIRMAN: We have had a number of things to discourage us on putting this fatigue elimination through and one of them is this—

In 1917 when we went into the war, all of the exhibits of the first small museum of devices for eliminating fatigue were given to Colonel W. O. Owen, the Director of the American Medical Museum—the largest medical Museum in the world—at Washington. Colonel Owen a short time thereafter was retired for age; they kept him six months after his age for retirement in order not to lose his valuable services.

Colonel Owen did remarkable work while Director of the American Medical Museum, and developed the technique of the laboratory work of the best scientific motion picture laboratory. He became so interested in what could be done for the greater comfort of American citizens, for the citizens of the world, that he put his best life into this work and the films that he made in connection with this work that have to do with health and fatigue are remarkable and will remain so for some time.

General Georgas was interested and was with us heart and soul for the first museum of any government for the dissemination of information regarding the elimination of unnecessary fatigue in industry.

You know that conditions in some of the factories in America are astounding, and the only consolation we get is that in all other countries the conditions are still worse.

I am going to back up Mr. Farnham for taking the mercenary side of this subject. Apparently that is what we have to do—that is the hard side—the easy side will take care of itself. I will tell you that I have

actually resigned from one factory because they would not grasp the opportunities to make money by making greater comfort for their people.

The Chair would suggest a motion to the effect that one of the many unused war buildings at Washington be made a temporary museum for devices for the elimination of fatigue in the industries, in the households, in the schools and in the institutions.

The question of fatigue has been brought out thoroughly by the men speaking here today, and it is a matter of the loss of undoubtedly twenty cents per day per worker. When I said that at the Pittsburgh Convention, some of our friends laughed, and then when the National Safety Council took the statement and considered it carefully, they made this reply: "Twenty cents per day seems ridiculous, but who is prepared to deny it? We cannot deny it and it looks right to us." Most people will deny anything if it is big enough—sometimes just to prove that a thing isn't so. In many cases the loss costs \$1.00 per day.

As suggested in my report, I feel that this meeting should adopt a resolution expressing our sincere sympathy to Mr. French's family for the great loss they have sustained. If there are no objections, I will ask Mr. Alford, who was an old colleague of Mr. French, to act as a committee of one to draft suitable resolutions and send them to Mrs. French on behalf of the Committee.

I told you yesterday of some of the remarkable work accomplished in fatigue elimination; we are glad to have foreign members on our committee and are thankful for their valuable co-operation. We also have Mr. Alford and his magazine working for us; Mr. Livingstone and his "Business Crucible", and many other magazines have been extremely kind on the subject of fatigue. Mr. Thomas Dreier's "House Organ of House Organs" has done particularly good work in disseminating information regarding the elimination of unnecessary fatigue. It seems to me that is time that we have a place for the collection of this material and I would like to know how the S. I. E. feels about using one of the buildings at Washington for the collection of data relating to fatigue".

Mr. Emerson made a motion for the establishment of a National Museum for the collection of information regarding fatigue elimination in industry. This motion was seconded by Mr. Kunze and unanimously carried.

THE CHAIRMAN: We are beyond the hour for adjournment so must bring this very interesting meeting to a close. I thank you for your attendance.

ADJOURNMENT

FRIDAY AFTERNOON SESSION

April 29, 1921

"PRACTICAL METHODS OF TESTING APPLICANTS FOR JOBS"

Chairman: WILLIS WISLER

Chief of the Bureau of Industrial Relation, Extension Division,
University of Wisconsin

THE CHAIRMAN: The meeting will please come to order and we shall proceed. We have a rather full program and we want to get through with it as rapidly as possible so as to permit as much opportunity for general discussion as possible.

I think this is a most important topic for the present time. No subject in the field of Industrial Relations could be more important than the problem of successful selection and placement of workers. Important as this matter was in times when production was our greatest need, it is perhaps even more important today, when the employer is being confronted with the need of reducing his labor force. No one will dispute that the greatest economies in production could be effected if we could select with certainty the best man for every job. It is not, however, my present function to make this topic the occasion for an extended address. It is my desire only to shape as definitely as I may the basic problem we need to attack in this afternoon's discussion. I will try to do this as briefly as possible.

I consider the appearance of a topic such as this on the program of The Society of Industrial Engineers as a very important step forward not only for the Society but for the administration of industry everywhere. It marks the recognition of Labor Management as the essential other side of Production Engineering. It has seemed to me that Industrial Engineering could claim for itself a separate field from the other forms of Engineering which enter into industry only in so far as it includes the personnel problem; it is the reconciliation of the worker's will with the production expectations of Scientific Management that justifies this separate field of Industrial Engineering.

It is very important, then, that at this juncture we should take every precaution against repeating the unhappy experience of Scientific Management. It seems rather unfortunately significant of the short-sightedness of Scientific Management that it should have done so little toward developing

that proper recognition of the worker's psychology which Taylor himself did not neglect to emphasize. The obsession of Scientific Management for mathematics to the neglect of the humanities seems to hold the explanation for the persistent antagonisms Scientific Management has had to encounter during the past. The distinct recognition of Industrial Engineering as something more than merely a combination of Production Engineering and ingenious wage stimulants can do much to disarm these antagonisms.

But if Industrial Engineers are now turning to Personnel Management, or what they may be pleased to call "Human Engineering," moved primarily by the hope of using it as an additional instrument in forcing upon workers rigid mathematical expectations, we shall only enlarge these antagonisms and completely undo all the good repute Personnel Management has achieved. If selective tests shall be used to discipline and to penalize workers who fail to fulfill the expectations of Scientific Management, then it will soon have all the evil odor of the stop-watch and the speed-boss.

The great hope all of us entertain in this new fusion of Production Engineering with Labor Management lies in our expectation that managers will come to see that scientific accuracy of standards should be not so much for enforcing production as for giving to the employer and to the employe just bases for calm and intelligent negotiations. The employer with rigid scientifically determined standards of production may be just as bigoted and unreasonable as the unionized worker who insists upon the literal application of union scales and trade regulations.

Whether bigotry and prejudice arise from a conviction of having the final and absolute truth, or whether they arise from a contempt for the truth, the effect is equally bad. And it is only when we regard engineering data as the beginning rather than the end of our relations with workers that we can hope to make appreciable progress in developing a genuine good-will which may translate itself into more profitable production.

It is of the utmost importance, then, that we should proceed in the proper spirit, and that we should proceed with the greatest openness of mind. We need to rest our conclusions upon facts, and by facts we mean evidences which can be verified in experience. We realize how hard it is to draw the line between those subtle impressions upon which all of us rest our judgments on those we meet, and those evidences which will bear the test of accurate measurement and standardization. No doubt our vanities play a large part in this difficulty. Few people will deny that they have unusual powers of discrimination in analyzing the characters of others! It is a pet weakness we are all prone to.

I recall my boyhood observations of the satisfaction many people got out of applying the theories of Fowler and Wells; how phrenological read-

ings became a popular parlor sport in which none were too humble to engage. I do not say this to the discredit of the claims of phrenology and physiognomy, but only to illustrate the frailty which makes this problem of selection by vocational analyses such a serious and such a delicate one.

But we cannot afford to juggle, or to pretend, or to parade. Too much is at stake to justify any attempt at saving anyone's face at the expense of the integrity of any psychological or philosophical theory. In fact an occasion like this requires the utmost honesty and courage. On no other basis can we expect to achieve anything but harm by a discussion of the present nature.

In proceeding with an examination of the various types of selective tests, I wish to emphasize the need of constantly keeping in mind the probable prejudices and skepticisms of both workers and employers. It is not enough to convince ourselves as to the best procedure. We need so to clothe the best procedure as to be more readily accepted by workers and employers. This means that we must strive for the utmost simplicity of mechanism. We must avoid making extravagant claims. We must be able to say frankly to both that these methods are on trial and that all we can pledge is that we shall tell the truth as to their value after we have the requisite data. It will mean that we shall have to proceed not as though we were proceeding as in a laboratory, but as though we were proceeding in the shop. We shall have to bear in mind constantly that apparatus must be simple, inexpensive, and as economical of time as possible.

It is a very easy matter to develop symmetrical exhibits when the conditions under which the data is being collected can be forecast and controlled. The success of any system of selective tests for industry must depend upon its success in the shop,—its success with the crudest of apparatus in the most unfavorable of environments with all the distractions and stupidities we can so readily exclude from the laboratory.

One of the features I trust will be dealt with in this discussion is the proper division of the field of selective tests. Surely nothing can put us in so ridiculous a light before the hard-headed practical shop executive as will quarrelling among ourselves as to jurisdictions. Frankly the lines of division are not at all clear in my own mind, and I am looking forward with a very lively interest to this discussion as a means of clarifying the confusions which I know exist in my mind, and which I suspect exist in the minds of many of us here today.

Taking this matter roughly, and I doubt whether we can take it too roughly among ourselves, there seems to be not only this problem of jurisdiction, but also the problem of procedure.

I have concluded from my observation and experience that there are

four types of procedure: (1) Performance method; (2) The rule of thumb; (3) The intuitive; (4) The scientific method. It might be that no one of these can legitimately satisfy all of the needs in industrial selection, but it will be to our interest to find out as exactly as possible on what each bases its claims of success.

This conference, I urge upon you, should be frank, as concrete, and as informal as possible. In short, it should be a free-for-all catch-as-can affair. If some of us succeed in losing our tempers before it is over, I believe we will be that much nearer the truth. By all means let us cut out pomp and parade; let us avoid fine talking let us steer clear of needless technicality; in short, let this matter be thrashed out so thoroughly that the most backward of us can go away with a clear conviction of how far we have gotten by this discussion.

Trusting you may keep these admonitions constantly before you, we now proceed to the more detailed examination of the field by men who have made this problem their special study.

We have been rather fortunate in getting men not only on the program but others who will assist in the discussion who, by careful study and examination and by experience in shops in industry, are prepared to tell us something upon which we can rest our questions and discussion.

The first approach to this topic we have made the matter of "Job Analysis," as it relates to the selection of workers in industry. Mr. I. S. Griffith, Director of Industrial Education at the University of Wisconsin, has done a great deal of work along this line. He will speak to us on the topic of "Job Analysis and Trade Tests."

"JOB ANALYSIS AND TRADE TESTS"

I. S. GRIFFITH

Director of Industrial Education, University of Wisconsin

First, I am going to try and outline the fields of responsibility. You have represented on the program, among others, three fields or departments in the university: (1) Department of Psychology, interested in manual and aptitude tests; (2) Department of Education, interested in general intelligence tests; (3) Department of Speech Hygiene, interested in speech, in the physical welfare, etc.

One of our charts is the result of the army tests during the war. This chart gives the results of examining 80,000 men. The general intelligence tests were given the men with these various classifications as a result. Labor comes under the semi-skilled field, then comes personnel, then you

have the skilled which ranges higher in general intelligence, and then you have the professional group; which range the highest. Our engineers stood very high in these tests.

The second chart was used to show what happened in the training of these selected men for army officers. Those who succeeded stood very high in the intelligence tests; those who failed stood lower. The point I want to make is this: It was thought that if we were training leaders all we needed to do was to give the general intelligence tests—in other words a test for the intelligence. Now I want to point out what I think is a falsity in the logic of this deduction. I think we are hardly justified in saying that because all of those who succeeded stood high in intelligence, therefore intelligence is the only thing that we need to consider. You may see it better probably in this analogy. We might say that all monkeys chatter but it wouldn't be true necessarily that all things which chatter are monkeys. That is what we call an "undistributed middle." It simply means that the test to me is a very important factor, but it is only one factor.

I happen to have Volume II of the Manual of the Army Personnel System of the United States Army, and I should like to read just one paragraph to show you the attitude of the Army people themselves, the ones who got up the tests and administered the test with reference to this: "The mental tests are not intended to replace other methods of judging a man's value to the service. It would be a mistake to assume that they tell us infallibly what kind of a soldier a man would make. They merely attempt to do this by measuring one important element, namely 'intelligence'. They do not measure loyalty, bravery, power to command, or the emotional traits that make a man carry on. However in the long run these qualities are to be found more frequently in men of superior intelligence than men of inferior intelligence. This, then, is the most important single factor in soldier efficiency apart from physical fitness".

So you see their position is that "intelligence" is a factor but they do not say that it is the only factor; they merely place it above other factors, apart from physical fitness.

Mr. West will discuss the intelligence test while I shall deal with trade tests.

In giving trade tests this chart shows that if we give intelligence tests and a man fails, we will say, down in the middle division, probably lower, we have tried to make a skilled mechanic of that man when he doesn't have the intelligence.

Professor Payne said that possibly it is a mistake to take a man who is strongly intellectual and put him in a type of work which does not require intelligence because he will become dissatisfied. He is able to do a

different type of work. So we do believe in an intelligence test but that will be discussed later. I shall confine myself to the trade test.

Here is an enlarged chart from a blueprint used in a training department. The number at the top here "A1" indicates that it is an early chart, a chart prepared in production for a beginner in this type of wood-turning work. It compares quite well with the standard instruction card of the production departments. The form is just the same but we have added a column, showing the name of the object and the total number of operations. The total number of operations in this case happens to be one. You can tell what is going to be used on a training job as well as on a production job, and on this one the tools required are indicated so that the tool room man knows what tools to put into the box to get ready for the operation, the stock number, time, the number of pieces required for the job, and the size. The rest is the same as we have used in the production departments.

Down below instead of a separate blueprint for the project itself we put the diagram on the same sheet. It is more convenient to handle one instead of two. Nearly all training jobs are sufficiently small that we can get the drawing on the same blueprint without much inconvenience.

Then below you have the standard practice, what might be called the "operation order" or routine. It is much abbreviated for instructional purposes for the first instruction given an apprentice but it corresponds more nearly with the "order" giving production operations in which are simply indicated the standard practice.

What I am trying to point out is that you want to give a man a test; send him to the training department to take the test on the thing he wants to do. In a well-organized training department where everything is standardized it is simple for the training director to get the blueprint for the job to be done, give it to the learner, make arrangements in his training schedule so that he can get on the particular machine and then let him do it. As a test for skill, aside from the probable correlation of talking about it, the one best way is to actually let him try to do it. In the wood-turning test we found that some people could get by on the oral test but when they came to the performance test they couldn't use the tools and bluff their way through. So we are arranging these performance tests in such a way as not to interfere with production.

For instance, some who took the test for wood-turning insisted the word "dog" applied to a part of the wood turner's outfit. Now anyone who insists that a "dog" is a part of a wood turner's outfit is not a wood-turner, he is a worker on a metal lathe. We do not use a "dog" on a wood-turner's job but we do use it on a metal turner's. In considering

him for a job we wouldn't give him a performance test because we would know that he was not a wood-turner. If the applicant passes with a fair rating on that test then we give this other test. (Applause)

MR. ARTHUR F. PAYNE (Minneapolis): I want to take advantage of what he said. I didn't know that I was misunderstood yesterday and if the majority of the audience got the same idea that brother Griffith got from it I must have made a sorry mess of it.

Intelligence is the fundamental essential qualification of an executive or anybody else. I want to admit that I qualified my statement yesterday. We know very well that character, that initiative, imagination and all the other fifty-seven varieties of qualifications which an executive must have you cannot have unless you first have intelligence.

We have the tests. All we claim for them is 87 per cent efficiency and the people who oppose these things are always opposing them in terms of the unusual exception which we admit and eliminate from our tabulation.

For years we have known that success in school work is based entirely upon intelligence; because a boy has good physique, because he has a desire for an education or an interest or anything like that is no indication that he is going to get through college if he lacks the intelligence necessary to do the work.

Mr. Griffith spoke about the Army qualifications and also about the trade tests which were made up by the Army. We have Professor Rise from Illinois with us this afternoon and perhaps he might add a little to this discussion in regard to the use of the Army intelligence test; he might tell us, as he told me this morning, that the trade tests have been abandoned entirely by the army people.

THE CHAIRMAN: We are drawing fire more promptly than anticipated. Although it meets with my approval, let me ask for the benefit of others scheduled to speak, that if you will jot down your question and bring it up after all the papers have been read, we can then have one grand slaughter at the end!

We have had the presentation of trade tests as a basis of selection with emphasis largely on the performance end of it and we are taking up next the aptitude tests of which Mr. Griffith spoke, i. e., tests for beginners, people who do not claim any trade skill or knowledge.

Professor C. E. Hull of the Department of Psychology at the University of Wisconsin will discuss this phrase.

"VOCATIONAL APTITUDE TESTS"

C. E. HULL

Department of Psychology, University of Wisconsin

Mr. Griffith has indicated quite clearly, I think, the relation between trade tests and vocational aptitude tests. The matter of trade tests I should say is very much a simpler matter and yields returns much more quickly, giving a higher degree of correlation than the vocational aptitude tests which I am about to discuss.

As he has already suggested, the vocational aptitude tests are exactly what the name indicates. It is a test designed to get a line on the innate capacities of one learning how to do a job. Now this obviously has a very wide range of use. A large number of factories receive applicants and take on men and women who profess no knowledge and skill except a good will and a capacity to learn to do the job.

In an enormous amount of the work done in the factories no skill is demanded. The only thing the employer wants to be sure of is whether the employee has the right kind of stuff so that he will make an efficient employee if given a chance.

Now we have this thing in the vocational schools, we have it in the vestibule schools, in places where apprentices are taken on. I do not need to emphasize the cost of taking on an apprentice and spending some weeks or months in training that person with the hope that he will become efficient after a time. All those cases that fail are a very considerable loss. The object of these vocational aptitude tests is to weed out these inefficient ones as far as possible before they get in and have money spent on them.

I shall try and indicate something of the technique or method by which these tests are developed. It is somewhat more difficult and more exacting and requires more skill and knowledge and insight than it does to operate and devise tests for acquired skill. In the case of a vocational aptitude test you have got to get into the person's mind. The novice doesn't profess skill or information. You cannot ask him what he knows. He doesn't profess anything. That means that you must get into his mind somehow, find out whether he has got the traits in him which will make an efficient worker. It is a matter of some difficulty and you must go about it in a scientific manner and very carefully, getting an exact measurement of these traits.

In order to do this you first have got to study the job. You have got

to make a psychological analysis of the job. There are two types of job analysis. There is a type of job analysis that some of you are familiar with, namely, the type designed for the efficient operation of the plant. I am not talking of that type but it is perfectly obvious that in order to devise a set of tests that is going to get into a person's mind—in order to get those innate aptitudes,—you must first study the job and find out the traits the job demands. That means that you have got to go in and study that job with great care. It is not merely a mechanical study of the thing but you must study the psychological traits in the job that determines success.

A mere external study will not suffice; you must have a considerable knowledge of human nature and the practical type of psychology to know and to make a shrewd guess on the psychology of the job in order to succeed. Now many people, particularly people who are psychologists, are at a disadvantage because often these people do not get to really know the job that is under discussion.

Recently we had an instance of this in a hosiery department. It was necessary for our investigator to call in all the information he could secure to get a slant on the psychology of the job in the mill. It was also necessary for him to get in touch with the head of the teaching department, the vestibule school, and, with the four ladies in charge of that work. He had to go in there and learn to do the thing himself and get a deep insight into exactly what makes the difference between a poor and a good operator, and that you may be assured is not an easy job.

After you have done all this you are up against the next proposition. After you have analyzed what are the traits that make for success, you have got to devise tests for those things. You have got to get some sort of a test to measure these different traits. Now if I may be permitted to connect up with the discussion that has just preceded, from my point of view, the capacity to do these jobs depends upon different kinds of intelligence. I think both of the people who have been in the preceding argument will agree that there is not an hundred per cent correlation between a person's memory and a person's imagination. There is not an hundred per cent correlation between the ability to imagine things and the ability to reason. In other words, from the point of vocational testing, general intelligence is a component of a lot of intelligences. You have got to size up what particular traits of intelligence are needed and then after you have done that you have got to find these tests to measure those things; that requires a considerable amount of experience, psychology and knowledge of tests and what tests can do.

There are two types of tests that may be used. I have here several

samples of each. There is what might be called an abstract test. Here is what we call the "A" test. It consists of a great number of capital letters. The subject is given a pencil and told to cross out as many of a certain letter as possible. That doesn't look like much of a job but it tests optical guidance. You have got to have good eyes and mind and quick movement to cancel those letters out.

The time limit is usually one minute and an inexperienced person without training will get from two-thirds to four-fifths of the test finished. You will find these tests given in the appendix of Link's and Whipple's books.

These tests are useful. They are often on paper and are easy to administer. They are quick and lend themselves readily to quantity measurements of performance. Sometimes these things will test what seems to be the important traits making for success or failure on certain jobs.

On the other hand there is a different type of test which might be called the "job in miniature." By that I do not mean in a knitting test you would set up a knitting machine and have them try and see if they could operate it. What I mean by a "test in miniature" can be best illustrated by the device I have here before me for testing for hosiery knitters. I haven't time to describe the operation of the knitting machine. I shall assume that you know something about it. I might say that the important thing in the operation of the machine efficiently is to put the "top" of the sock or stocking on the knitting machine properly. The skill seems to lie in putting the "quill ring" on the knitting machine. This ring is a series of points and the object is to put the "quills" so they fit on little needles. This ring must remain perfectly level to effect a perfect "transfer."

Now we were trying to devise some tests to test the knitting machine operators and separate the good ones from the poor ones and I have an attempt here at a miniature test. I lost some sleep thinking about this thing you see here for that purpose.

The question before me was "how am I going to measure that machine, hold the ring level, and put it in the middle and get it right the first time?" I had a steel jar made with this cover. I said I will let the top sleeve into the top of this jar. If they can put that in without hitting the sides they have good guiding ability. But how were we to tell whether the ring was level? I decided to place a window near the bottom so that I could see whether the pin was coming through straight. If they do not hold it level it will not hit the central point in the bottom. That is what I mean by a "miniature test."

We made another attempt at the University of Wisconsin to devise a

test for the steel lathe operators. Here you have the coordinated screws. The job is to take hold of each screw handle and trace the needle around in a circle indicated by brass points electrically connected with a buzzer. When the buzzer rings he goes on to the next one. We found that there was quite a high agreement between the score on that performance and the score shown by the efficiency of the men in the shop. These are samples then of what I mean by "tests in miniature."

I want to say just a word about why I believe in these "miniature tests." They enable you to size up the job properly and are more likely to get a hold of these different intelligence capacities in their proper proportion. That is why I think they are better than these "abstract tests." However, they are both used and should be used according to their greatest promise as shown by test.

After you have found and devised your tests to measure these different traits, then the next thing is to administer them. You cannot sit down and say: "Here is something I want you to get." You must try them out and find out which of your projected tests really work. In the past we have wasted money and effort and have been disappointed because people sat in their armchairs and thought it over. Let us take the case of this steel jar. I thought that this would duplicate the knitting machine and that it ought to have a high correlation. You cannot assume that. I will tell you why. What you have got to do is to go into your shop and get production records on a bunch of people and you ought not to use less than sixty workers, if you can get that many. Use more if you can get them. Get those of known ability on that job as shown by production records. If you cannot get production records get ratings of their efficiency on the job by the foreman; but good production records are decidedly the best thing you can get. Then put these people through these tests and compute the correlation and see whether the tests are satisfactory.

There have been many claims made for different methods of testing employees. You cannot assume that these tests are satisfactory without testing them out. Just to show you how little we can trust the best intentioned and most conscientious attempts at an analysis, let me return to our experience with this steel jar device. We ran sixty employees on that test in a well known hosiery factory and we found that that test had almost a zero correlation with the job! I do not know why it turned out that way. We did our best and it still looks as if we had solved it and yet there is no correlation. You cannot safely assume anything beforehand.

Mr. Wisler tells me that if he had taken that out he could have per-

suaded a lot of people to take it on and they would have fallen for it. You see now you cannot tell; you must try it out yourself.

You can count on at least this much: If you try a dozen tests there will not be more than five of those tests which are worth keeping. You must try at least three times as many tests as you will use, because you will have to throw out a whole lot of them. We tried eight or ten different tests and then tested them separately to see if there was any correlation between each test and the job itself.

After you have done that perhaps you will throw out eight out of a dozen. Say that you have four tests that have some kick to them,—then what do you do? You throw out the bad ones and keep the four good tests. But you are not through. You will find some of them had a high correlation and a high predictive power while others had a small predictive power. That means you must weigh them according to their diagnostic power, according to their predictive power. You must for economy cut out duplicates. After you have weighed them and determined the maximum amount of predictive power then the thing is ready for use.

In conclusion I should like to say a word about correlation. You cannot get far on this work unless you compute correlation. It requires a little arithmetic and means simply this: Suppose you have sixty employees; these employees have records of production. We arrange them in sequence according to their best production on down to their lowest production record. Now if you have a one hundred per cent efficiency test it will show the best production test record, and the person with the next production record will show the next best test record and so on down the line. It is a simple matter of arithmetic to rate them on production and if the tests agree you have a one hundred per cent correlation. If the tests disagree in every way then you get a complete negative correlation.

We have always found that there is only a partial agreement so we apply a simple formula which you will find described in Link's book, in Hollingworth's book, or in Whipple's book. When you have worked that out you will find that the index will run all the way from zero up to a hundred. A single test that will give you a correlation of thirty-five or forty is a good test. A lot of these tests will not. This particular steel jar test gave no appreciable result.

Here is another test. I shall let you guess on what this correlation should be. Here we have a matchboard test. These little holes are arranged in two columns and here are a lot of little matches. You would think that would involve quickness of motion. We found that that test gave practically a zero correlation. I do not know why but it was prob-

ably due to the fact that we didn't properly size up the job.

So then we had this matter of correlation which should be considered carefully. I wish to say in closing that when people come to you with claims that they have a method whereby they can look at a person and tell whether he will make a good wood-turner, a good lathe worker, or a good machine operator, ask them: "What kind of a correlation have you or how much kick has the test?"

If you have a high correlation it is possible to make accurate deductions. Take a bunch of people of known ability, test them and see whether the device separates the good ones from the poor ones.

Here we have before us a set of tests that Mr. Pollack working with Mr. Wisler and myself worked out for a hosiery concern. The girls were required to pick hose out of stock and mate them for length and shade of color and super inspect—all at the same time. We arranged ten or twelve tests and tried them on about 60 operatives of known production and found two-thirds of the tests were no good. We took those that were good and kept them and finally we got a correlation of forty-four..

In that particular case the girls who were above the average were getting a little over five cents an hour more than the girls who did badly. That might seem to be unimportant but that small increase of five cents an hour means ten cents an hour for the company and if you could reject half the applicants you would raise the efficiency about ten cents on every employe on that operation. At the end of a year that would amount to quite a considerable saving.

Physiognomy, phrenology, graphology, and all the other different systems of selection of employes must come across and show what they can do. Let us do something. I think some day we will have a higher correlation. Link can get as high as a sixty correlation but at any rate make these people come across. (Applause)

THE CHAIRMAN: I am rather sorry that Professor Hull has been so exceedingly modest and has talked so disparagingly about his good work, but we have some tests here which we hope you will go through afterward as there is some controversy being foreshadowed on these intelligence tests I am much relieved to turn the floor over to a man who knows more about it than I do, Professor Paul V. West of the University of Wisconsin.

"GENERAL INTELLIGENCE TESTS APPLIED TO THE INDUSTRIAL FIELD"

PAUL V. WEST

Department of Education, University of Wisconsin

I think you have in Professor Hull a living illustration of a scientist. Some of you may not know what a scientist is—look at Professor Hull. There are not many men who would admit failure on these tests before an audience like this—most of them would keep still about it.

In speaking about general intelligence tests and tests of mental ability rather than specific vocational aptitude tests, comparatively little has been done in the industrial application of such general intelligence tests.

Here we have before us a distribution chart. You will see that the grades rank from "minus" to "A". The officers generally rank high as compared to other groups. The officers' training corps rank almost as high. The sergeants, non-commissioned officers and corporals rank lower. The enlisted men had but a few in the high grades while the majority of them ranked "D".

Here you may compare the officers with the executives. In the next class you have the foremen and superintendents which would compare with the officers' training corps. Next comes the non-commissioned officers who would rank with men of a lower grade, having possibilities for future advancement. Below them comes the bulk of labor, i. e., skilled and semi-skilled labor, and below that grade comes the unskilled labor, and so on down to those who will be a menace to the organization if kept within it.

The most significant chart here is the application of the Binet tests to 669 different individual adults and represents the combined results of many different tests. Along the base line here you will find the percentage of the groups. In this upper group you will note that we tested 153 college students with an average of from 85 to 120. You will note that this heavy dark line is the **normality** or 100 per cent mark. In this case the majority of these men fell above the normal. The next group is a group of business men. You will notice that there are over forty per cent of the business men falling to 105 per cent of normality, with a general average of 102 I. Q. (intelligence quotient.) These business men were of the small class, just common business men. None of them were wealthy and none of them were a failure in business. Many of them were not high school graduates. One man in this group had an I.Q. of 81.

While he was not a great success in business, he was doing better than any of the others, but it was found that his wife was the brains of the business and was generally admitted to be so. Nevertheless, he was reputed as a general business man with an I. Q. of 81.

In the case of the next group, you have 173 motormen, policemen and sales-girls, in which you find a remarkable balance running from 115 per cent down to 65 per cent of normality. Now in these groups you will find the arc gradually falling. They are composed of the semi-skilled occupations and have certain typical results. With regard to this group, in giving the Civil Service test to a city group on the basis of these results of the intelligence tests, the Civil Service Board hired the employees for the firemen and policemen of the city.

Four of the lowest grades made were 63, 74, 77 and 79 on the intelligence tests. Those men had been in the fire company for a long time as extras and had gotten into there originally by "pull," through a certain "drag" with the city regime and were generally recognized as being deficient.

The man rated at 63 per cent had never earned two-thirds of the salary of a regular skilled worker or semi-skilled worker. These men were generally loafers and hung around the corners. In this group was one of 67 per cent intelligence who was also noted for his defectiveness. Everywhere he was recognized as being defective and being a man of mediocre ability. The man who received an I. Q. of 71 had worked as a porter and then became a signalman on the railway. A man of that intelligence has no business being a signalman in the railroad yards. He was soon taken out of that employment and wanted an easy berth as a fireman.

Then you have the class from 77 to 81 per cent who were generally unskilled workmen, shifting continuously and not giving satisfactory service. In this group there was also one with a grade of 112. Upon examination we found that he was a youth out of high school who had earned \$125 a month as a salesman and wanted a job as fireman so that he could take a correspondence course—that was his object in getting into that service.

I am trying to point out the results of these tests. These tests will show individual characteristics which are significant in individual diagnosis.

In the tests for motormen it was interesting to note that the percentage was only 65 for one motorman. Upon examination it was found that he had just previously to this test lost his position because of an accident which might have been averted.

It was generally considered that no man below a grade of 75 per cent

normality should be engaged as motorman for the street car company because of the fact that he cannot be trusted in an emergency.

In the investigation of sales girls it was found that the women having the same I. Q. as men were handicapped in the economic situation for employment, that it is generally easier for men to secure situations when they have the same degree of mentality.

The Express Company employees were given tests and they ranged from expert clerks down to drivers on the wagons and this red line indicates those receiving high grades and those of lower mentality.

Examinations were made of 256 hoboes and others. They ranked from a high degree, from 125, down to 55, the lowest of the whole group. You cannot say, as a general rule, that unemployed men are unemployed because of defective intelligence. It may be due to other factors and you will find among them men of high intelligence but men who through moral habits have become shiftless and untrustworthy.

In summarizing what has been said, the prime requisite is to give to the employees mental tests which will determine their mental ability, to learn the occupation which they must master, also to determine to what point they can be elevated within that particular industry after the trade tests, the adaptability tests or the vocational tests properly can be applied. They may be applied at the leisure of the company and in ways that they may find it possible to administer. The first primary requisite is to know your men mentally, to know what they can do in a general mental way and to put your finger upon them and to be ready at any time to give them an opportunity to succeed in their line.

I believe that such a procedure will lead to real humanitarianism and to real business economy in the future industrial relation between the employer and the employe. (Applause)

THE CHAIRMAN: Thus far we have been dealing with the more familiar phase of the problem and now, to be thoroughly complete in the matter, we are going to dive beneath the surface. We are having Dr. Blanton speak to us on "Scientific Methods of Determining Personality of Workers."

"SCIENTIFIC METHODS OF DETERMINING PERSONALITY OF WORKERS"

S. BLANTON

Department of Speech Hygiene, University of Wisconsin

From my experience, I do not think that psychological tests alone are sufficient in screening out applicants from jobs they cannot hold. I do not think there is any discrepancy at all between the attitude of Professor Payne and Professor Griffith.

My experience is based on the examination of 50,000 men in the Army and experience in the combat division and a recent test of 8,000 people in alms houses, jails and people who could not find employment. Through these tests it was possible to find out their mental qualifications but we wanted to study their personalities, to find out how they go into their situation. We found that only a small percentage of people in alms houses and jails were there because they were defective mentally. They were there because of personality difficulties.

As mentioned in the report drawn from this survey, we found indolence, lack of ambition, lack of prime impulse, inefficiency, instability, violent temper and many other defects. We found the over-active, the restless, the weak willed, the sluggish, the over-suggestible, the selfish, the unappreciative, the cruel, the individualistic, the shut-in, the timid, the hyper-sensitive were feelings of inferiority and we also found many other personality traits.

That shows to my mind conclusively that we cannot pick them out by mental tests alone. I am willing to admit a person with high grades on mental tests is likely to have a fairly well-balanced emotional life, but the correlation is not so high but that we have to carry on other studies. There may be many people who can succeed quite well who may make very poor grades in the tests, who may have poor mental tests, because their emotional life will not allow them to take the test well.

For example, in the hospital at Waukesha we gave a test to a person who registered a mentality of thirteen years. He went out and stole an automobile, was arrested and placed in prison and when given another mental test he showed a mentality of eight years. In other words, the emotional test made him drop down five years.

In the Army tests the men were sometimes perplexed. Their emo-

tional condition was such that they did not do themselves justice on the tests. I believe from twenty to thirty percent of the people did not do themselves justice in these tests. (Applause)

THE CHAIRMAN: I should like to hear from Mr. Ream, from the Leffingwell-Ream Company on this subject. I believe he can give us some of these tests applied to the higher levels of employment.

MR. REAM: I do not want you to feel that I am coming here to tell you how to work out any certain method that I know about as a panacea. I am bringing you simply a little of my own experience.

If I may put it to a vote I should like to know how we are represented here this afternoon. I believe in this work there are three general groups: (1) the educational; (2) the business and industrial; (3) the engineer. I am interested in those divisions because I have served in all three to some extent and I think I can perhaps say my message better if I know how we stand.

(A vote showed the business men predominated.)

We have had the problem of selecting our men and I want to say to you here that so far as I know in the business of management, engineering, or industrial engineering, that is a serious problem. How can we select a man who will perform according to our standards and do justice and more than justice to the client?

I shall tell you how I tried it. I happened to be acquainted with a man who is well known for the development of tests—you all know him very well who are interested in this subject. One of my friends got two copies of his tests when they were being passed among the chairs at a lecture. These copies were taken up at the end of the lecture but my friend gave me this extra copy.

It gave me an opportunity to use that test and I used it on thirteen people. I happened to be in two series of lectures so I got that test twice. The first time I didn't measure it because I thought I was going to have it back again. The second time, however, I took my own time on it and in that way was able to get a fairly good measure on one of the tests where each part of the test was timed and you were told to stop and start on the next one, i. e., you had so much time for each test.

I wanted to find out if I could get from this intelligence test some information on how to employ, how to select an engineer. I had not found anything in our text books that told me what to do. I gave the test to thirteen people one of whom was my secretary, a young lady who had finished high school, one was a man known all over the country for his work in engineering and another was a lady who had developed as an engineer in a resident capacity with a business house and had done very well.

The range of time required by these subjects was from two minutes up to I believe twenty-three minutes. There was that great variation. The one who had the twenty-three minute record was the engineer who was known the country over. The record of two minutes was made by my secretary, a very competent girl and not highly educated, only a high school education. The lady who was working on this kind of work on engineering for a client made not only a slow record but one that was not very accurate.

I gave up immediately using intelligence tests for selecting engineers. I think there is a reason for that. I believe the engineering type takes more time to think it out. They are cautious. There are other things to be considered.

So there was nothing to do but set about some way of finding what an engineer was composed of. I will give you as briefly as I can what we found. The problem which I had to solve was what the applicant could do and what he could not do. It seems to me that is the first broad step: "What are the requirements?" We wanted to find out what he would do when he was on the job and what he would not do.

There are certain things that the engineer must not do on the job. He must not get into an argument; he must not fail to have tact. There is always trouble on management engineering.

We studied that question. Here are the phases which we selected: Character was placed first and under that I listed honesty, courage, truth, attitude, and since last night, I have added the word "charm." (Laughter) That sounds much better than the words I used "general agreeableness and friendliness." Next came common sense, tact, knowledge of two kinds,—general and technical. I emphasized general knowledge because the successful engineer must be something of an all-around man. He must know how to talk and how to feel and what to do in a variety of contingencies. He needs special or technical intelligence because he must know the engineering business, and particularly the branch of it which we might require him to serve in. Next I listed ability and this of course has some rather general characteristics. The ability to do the things which he would be required to do, and thoroughness and reasonableness. The engineer must think it through; he cannot guess at it.

We are now using comparisons for measuring these qualifications. In the first place, when the applicant comes in we tell him to sit down and in place of the usual shock absorber we talk in a friendly way and tell him something of our work so that he is at ease. We give him three interviews. We do not employ him until after the third interview. As there are not many engineers here, I will tell you why.

When studying salesmanship I learned that a good salesman could come in and make a good impression three times or as many times as needed but a salesman who was a bluffer, who could make a good impression on the first interview, usually slumped down in his chair and told you something you would want to throw him out for on the second and third interviews. We interviewed them three times to find out whether they would stand the pace.

I have here a set of the test questions and I shall in my remaining half minute read one of them so that you may understand something of their character. If a hen and a half lays an egg and a half in a day and a half, how long will it take to lay ten eggs. (Applause)

THE CHAIRMAN: There are still two people scheduled and if there are any of you who must leave early now is the time to bring in your questions. I shall take the liberty of stopping the discussion if necessary so that we may cover the entire subject.

PROFESSOR PAUL V. WEST: Some one asked if we should give the same tests to a person twenty years of age as we do to one forty years of age. As I have already indicated these tests have not advanced in the analysis of adults as far as they ought to. The general assumption is that a sixteen year old individual has reached normal mentality. After that time he is not considered as advancing his fundamental capacity. A person who passes a Binet test for eighteen years is called a superior intelligence, a sixteen year test as average intelligence, and a fourteen year test as inferior. That is purely an arbitrary assumption but it is the best we can do at the present time.

MEMBER: I should like to know why it is that a person who has not gone beyond the sixth, seventh, or eighth grade appears to be superior to an educated person in manual work. I had one case where the three best operators in the circularizing department who were required to stuff envelopes had not passed beyond the eighth grade. That seems to indicate that an educated person may be at a disadvantage doing manual work.

THE CHAIRMAN: Mr. West, do you want to answer that question?

MR. P. V. WEST: I think as far as my opinion is concerned I have noticed the person of inferior intelligence has done well in manual work as long as the general I. Q. doesn't fall below seventy-five. I am not certain that the more intelligence an individual has the less he is adapted for manual work, unless it be that the rational processes which he has mastered have interfered with his quickness of manual labor.

MR. L. C. SAGEMILLER: If I may be permitted to answer the question as to why the highly educated person does not become one hundred per cent efficient in the circularizing department or work of a manual

nature, I would say the highly educated person would not take the job or would not make good at it because it is monotonous. You cannot expect a person of high school intelligence to fold circulars all day long because their mind will get above that while the fellow who has not had much schooling will look at it as a steady job, as the fellow says: "I am not looking for a raise in pay, but for a steady job." It is just a practical proposition. We are not satisfied. When we were kids we were satisfied to do just as we were told but as we became older and received a better education we thought we wanted to get above that sphere. An educated person, in my opinion, does not want to do manual labor.

Ministers, doctors, lawyers and professors and many other intellectual men secured jobs in the munition plants during the war. These ministers who had formerly received eight hundred a year were making three and four thousand dollars a year in the munition plants, but after the war was over they either went back to preaching, or medicine, or whatever their line may have been.

MR. REAM: I realize the point that the gentleman has made but in this case it is true that high school girls were in the same department. To corroborate what he said, these girls had been there three years and perhaps the others had not been there quite so long, but they were intelligent girls.

THE CHAIRMAN: There was a question brought up regarding the use of trade tests in the Army. We have with us a representative from Camp Grant, Mr. O'Rourke, who might be prepared to say something on that matter. I am going to allow him three minutes to speak of the work he has been doing along this line.

MR. O'ROURKE: I am pleased especially with one thing. It seems to me that with the harmony this meeting has shown we differ more in technique and in terms, as, for instance, the meaning of "intelligence" rather than as to what we are really doing. We have passed through the stage of Fulton's folly, and the state of the public mind when Bell first attempted his telephone. There was a crank down there who thought he could talk through the wires.

I should like to speak of one thing that was brought up this afternoon.

Employees according to Mr. Ream's description were examined objectively. I do not consider those as actual psychological tests. In giving these objective tests you have no way of testing or measuring them. For instance, an employment manager at a large factory last week brought up a similar idea and said that that was just what he was doing. He said: "I am asking such and such questions," but a moment later he said: "Were the man in charge of that work to leave the factory he could not pass along his selective skill."

It may be interesting to know that a report by a committee of industries and schools is now being prepared in a certain concern to be published next July. Out of 176 industries which were interviewed for this report, 76 are using the army tests, 36 of which are using standardized tests. Their criticism is that the lack of standardization of statistical analysis, has been the cause of the failure in the different plants.

Briefly, may I outline the elements of the typical army test: (1) There is the oral picture test—simply studying the job analysis, studying the elements of a trade, testing these, putting them into form, (2) bringing out questions of processes rather than simply trying them out in performance, finding out which are diagnostically significant, (3) putting them into final form. This has all been already explained.

For example, we take army tests in machine shops, copies of which I shall be glad to distribute amongst those interested. We take a number of men who are qualified, and others known from experience records to be novices, apprentices and journeymen, and try them out. If our tests grades those men appropriately, we say they are good; those which are not good we throw out.

We have mentioned correlation tests. Let us say one test shows 50 per cent correlation, another test may have 50 per cent correlation with the same job, with the same workers, with the same ratings by the instructors. That does not mean that all the tests are equal. It means that the two tests grouped together may have a higher correlation. They are not testing, in other words, the same thing.

The statement that performance tests are being thrown out of the Army is an erroneous statement. During the war we had thousands of men come in. We used performance tests on skilled mechanics, etc. Now most of the men come in to learn a trade. Therefore we give a test for adaptability because they have no skill and therefore it would be waste of time in testing them for skill. We do test them with performance and oral-picture tests. In that connection, our oral tests have proven of almost as high correlation as the performance tests.

I made an experiment at one of our Army Camps a month ago. I found there was a difference between these oral tests. I have heard it claimed here today that a man may think he has the knowledge but forgets it when he works it and certain other men cannot talk about their trade. We have found that to be untrue. If a man knows his trade we find he can talk about it intelligently.

I took an oral general test of 140 questions on different trades, elementary and advanced. I took that test and guaranteed to the opponents of these tests that it would pick out the best men in their classes. I said:

"There is your chance. Your own ratings will decide whether you need retain these tests or not." They made up their independent ratings of their men. I didn't interview the men so rated. That of course was wrong; the test is only a help after a technical interview. After their clerks had written up the ratings the rank order as determined by our selective tests was almost exactly what the instructors had handed in. The men I had asked to be dropped were dropped and the men ranked in our compulatives as instructors became instructors.

Tests for industrial purposes must be tailor-made. You cannot take one test and apply it in different industries. You have got to know what you are doing in performance tests of that kind. I wanted to show you what results we could get through oral tests.

We have found three important factors to be considered: (1) They must differentiate between various degrees of skill; they must produce uniform results in various places in the hands of different characterists; (2) they must consume less time consistent with the worker; (3) they must take in the most general process to be used in the shortest possible time.

THE CHAIRMAN: I promised Mr. Payne that his question would be answered.

MR. C. E. HULL: I think I can best answer his question by showing what we did on one of our tests. One of our hosiery tests required a person to match up those of the proper length and shade of coloring. That is a concrete illustration. We found that there was a substantial correlation in the length tests where we tried to duplicate the length proposition by means of drawn lines. In the color shades we did not get a high correlation. I do not know why.

ADJOURNMENT

FRIDAY AFTERNOON SESSION

April 29, 1921

"RATE SETTING AND INSTRUCTION CARDS"

Chairman: W. M. C. KIMBER

The Leeds & Northrup Co., Philadelphia Co., Philadelphia

THE CHAIRMAN: We want to make this a really intimate discussion. We are not going to have any papers read. We have two or three persons who have had interesting experiences in their plants and who are going to give these experiences to us here. I think that, just now, we see more need for rating and good instruction cards than we have for the past few years. Rating, at least with us, through the war was merely a perfunctory matter. Raises were being given right and left to keep people working, and general raises throughout the factory were in order. During the last year or so, however, the situation has changed entirely. Now we have a better class and a more intelligent class of workmen, I think, and a good system of rating brings out a remarkable response.

The particular things we have found in our factory are that after the war there was a lowering of the general spirit among the people, and we have tried to introduce a rating scheme that would call forth more initiative and responsiveness from the people in their work. We tried a scheme a number of years ago before the war which was more or less satisfactory in this respect but was never worked up. We now have rearranged the rate setting and have bettered the whole arrangement, I think, so that we are getting real results. Somewhat later I may go into a discussion of our rating scheme, but I can summarize it in saying that we have got back I think a good deal of the spirit which we lacked after the war; the people are not pestering the foremen all the time for raises; they feel fairly satisfied that their condition is known and that they are being taken care of.

The steady rise of costs has to a great extent reached its peak and the present tendency toward reduction is largely on account of the new rating. The result however is complicated by other factors, such as new designs and revised methods of construction, so that the results we have obtained in lowering the costs, cannot be attributed entirely to the rating.

Mr. A. G. Bryant of the Department of Industrial Engineering of Joseph T. Ryerson & Son, Chicago, has consented to give us some of their experiences along these lines, and I have asked him to lead off in the discussion.

A. G. BRYANT

Industrial Engineer, Joseph T. Ryerson & Son, Chicago

Mr. Chairman and Gentlemen:—You will pardon me if I diverge somewhat from the immediate subject of rate setting and instruction cards to take up some of the things which I think are directly affected by it and which must be considered if any rate setting plan is installed with a view to satisfaction and permanency. I believe that the establishment of rates or setting of standards as we sometimes call it in the case of bonus and premium plans, cannot be done most successfully without taking into consideration the standardization of the operations themselves. I mean by this that you have to standardize your speeds and feeds, you have to standardize the arrangement around machines, you have to standardize your working conditions and you have to put the whole operation and every factor connected with that operation on more or less of a standard basis, before your rates are established and your scientific wage plan put into effect or else I believe the rating plan will not be as successful as it might be otherwise. This is not a new thought but I think the thing needs emphasis. Mr. Taylor, you recollect in his books brought out this very same point and it seems to me of paramount importance. I have seen many examples where men have attempted to put in some sort of an incentive wage plan on a group of men whose operations were not standardized and where within a very short time the whole scheme collapsed. We must have a standard condition before we can successfully proceed to install an incentive wage plan.

Need of a Balanced Program

Further than that I want to emphasize this point: I do not believe you can successfully put in a rating system and carry it on permanently and get the maximum results unless you also standardize a good many other features in connection with the plant management. I believe, for instance, that you must have some production control, you should have some planning and dispatching in order for incentives to be effective. I believe that you have to have some degree of standardization of the plant layout, that the equipment of the plant has to be in some degree of standard condition and that all of the factors involved in the operation of an industrial plant must be more or less standardized before you can accomplish very much by standardizing the operation itself, or the establishment of a rate. If you will look into the cases in your experience where install-

ations of so called scientific management have proven unsuccessful, I believe you will find that in many of these instances the failures have been due to the fact that some one has attempted to put in a dispatching plan and forgotten all about the rest of the plant, or has attempted to standardize the operations and put in a piece-work system and neglected everything else. I do not mean to say that you cannot set rates in a plant that has not been standardized along any other lines, but I do say that you get the biggest results by trying to work out a balanced program, by attempting to develop your production methods and your plant layout and your equipment and the standardizing of your operations all at one time.

For about fifteen years, in our plants in five cities we have been operating on an incentive wage or bonus system, which covers a very wide variety of operations and work. We have not had any very serious difficulty, we have not had any labor trouble whatsoever and we have not had to change our plan in all this time, and if I can summarize in any way the reason for the comparatively good results that we have obtained, I would say that they have been due to the fact that we have tried to bring all of the various features of plant management up to the same high standard of efficiency, and have not simply specialized on the one feature of rate setting and neglected other essentials.

Rate Setting

Now then, in consideration of the topic of setting rates, there are many small shops where jobbing is performed where the operations are not repetitive. In such cases we have a particularly difficult problem in the setting of standard times because we cannot afford to take a great deal of time to do it. We cannot allow a time study man to occupy himself for more time in making a thorough time study and analysis and establishing a rate than the operation itself may consume. It isn't good business. We, therefore, are required many times to make calculations or estimates based upon past experience or records in establishing rates or time standards. This, of course, can only be done where we are reasonably certain of accuracy, otherwise it is better to neglect the job as far as paying an incentive is concerned. But where an operation of any kind, whether it be mechanical or purely manual, requires a considerable amount of time or is likely to be repeated, it seems to me that there is only one sound basis for the calculation of standard time or rates, and that is by the method of time study analysis.

General Methods

I might say that there are three schools of thought in connection with

the standardizing of operations and the setting of rates, broadly speaking. One of these schools includes the man who feels that the setting of a rate is simply the foreman's job, that it is something for him to do by guess work, making use of his experience. I must say that in many cases because of the long experience of these foremen they are quite successful, but nevertheless the very fact that we are here discussing this problem indicates that this method has not been as successful in the past as it should have been or as it must be.

There is a second school of thought which includes Mr. Gilbreth and his disciples, the men who believe that we should have an extremely scientific analysis of the job. And there is the third group including those who feel that time study can be practiced in a comparatively scientific and accurate manner, obtaining the practical results that we are trying to get. I warn you that there must be a clear cut line between the first class and the third. The estimating of rates from past performances or from merely the opinions of people who have been experienced in the game is not to be compared in value with the establishment of rates on a basis of accurate time studies.

I believe it is this afternoon, is it not, that Mr. Gilbreth is addressing another meeting, perhaps fortunately for me, because if he were here I do not doubt he would take me to task for emphasizing the value of time study. Mr. Gilbreth I understand feels that the analysis of the job should be by a much more scientific and better process than the time study method, the stop-watch procedure, and I have no argument with him on this when we are concerned with very special operations. But I simply want to state this: that for the **majority** of the operations in most industrial plants about the country today the best means that we know of for establishing a standard time is by way of the stop-watch and it is particularly along this line that I want to talk.

Assuming that an operation will likely be repeated or that it will require at least a number of days, so as to give an opportunity for a fairly careful analysis of the job, the question arises as to how extensive a study should be made with the stop-watch. Should we take one or two observations and establish a rate on the basis of that, or should we take a hundred observations? Where is the middle ground? It seems to me that this is governed very largely by the type of operation under consideration. If the operation is one in which the units are repeated frequently and are of comparatively short length, for instance, five hundredths of a minute or ten hundredths of a minute or the elements of the operation are such that a large number of observations can be secured in a comparatively short time,

it should be possible and advisable to secure just as many observations as practicable.

I believe that we should set some limit on the length of time required to make a study before the time study man starts out. We should know what the possibilities for reduction of costs are on a certain job and this should govern the time study man very largely in the amount of time he should devote to his studies.

How minutely should a man observe an operation with a stop-watch? That is, how finely should he subdivide the motions of a man who is performing an operation? To me there is only one answer and that is that he should subdivide the operation just as far as it is practicable, just as far as his skill and ability as an observer will allow him to. There is this to remember. A man taking a study of a job has to remain to observe that job for a certain length of time and he might just as well during that period record the operation in its finest elements as to take an overall study of the job, and there are tremendous advantages in taking a subdivided observation. I do not need to go into the details of that because I think reference to Taylor's and Gilbreth's works, Gantt's, Merrick's and the various other books and articles on the subject today will convince any man who has had any experience with the matter that that is a fundamental of time study practice.

There is this to refer to also in consideration of this subject. I believe that not enough attention has been given to the mechanical equipment and the methods employed by a time study man in observing an operation. Frequently a man goes out holding a stop-watch in his hand and a piece of paper to jot down whatever he can get in a more or less haphazard way. I believe that the equipment, that is, the forms, the board that is used by the observer, and the manner in which the observer holds the stop-watch are very important matters. They involve the efficiency of the study. Just think what it means if that man makes an error of ten or fifteen percent, which is very possible if he has not the proper equipment with which to accurately record the data. It means perhaps a big error in the rate that is set, and accordingly a loss in production or even in payroll. Therefore, I think that is something that should be given special consideration; it is a vital thing in connection with this rate setting problem.

We have gone so far with our staff as to develop special observer's stands. There is nothing elaborate about them; they are simply observation boards so constructed that a stop-watch can be held in a clamp at one corner and observation sheets held in place. Where an observer is required to spend several hours perhaps, at a particular operation it helps

him a great deal. He is able to write almost as freely as if he were sitting at a desk, at the same time he is allowed to move around. We have some spans 600 feet long with stock gangs ranging through them from one to the other and a time study observer, in recording data in connection with these stock gangs, has to move with them from one point to another. Accordingly he has to have as little luggage as possible but the equipment has to be adequate or errors will result.

Selecting Standards

Now, then, how do we select our standards of time after we have made a time study? We have perhaps ten observations of a particular operation and let us say that the average time for the operation is fifteen hundredths of a minute, that the minimum time we have recorded is ten hundredths of a minute, and that the maximum time is twenty hundredths of a minute. Here we have a range from ten hundredths to twenty hundredths with an average of fifteen hundredths. What shall we take as our standard? What shall we set up for the workman to work towards, and what shall we pay him as a bonus for making this standard? I know of cases where the average is taken but I see no logic in paying a man a bonus for doing practically the same amount of work as he does when on a day-rate basis, which is what you are doing when you accept the average as your standard. Other people insist upon taking the minimum time; they say if the operator does it once in ten hundredths of a minute he should be able to do it again in that time. Others take some point in between the minimum and average time. There are others who have rather queer formulae that they use in computing a standard, but I do not know just what laws are the bases for them. It seems to me logical that some point in between the minimum time and the average time is the one to select for a standard. It has been my experience that each individual case has to be treated separately; we must take into account the type of man working on the job, whether he is a conscientious man, whether he is working accurately and skillfully and is living up to the highest standards of workmanship or whether he, on the other hand, is soldiering. We must take all of these factors into account in selecting our standard time, and furthermore, we must take into account the basis on which we are going to pay a bonus or a piece rate.

Take, for instance, the bonus plan patterned somewhat after the Emerson system. You recollect that there is an increasing curve of efficiency whereby bonus is paid. The standard is set and the efficiency for a given period is figured; at 100% a certain percentage of a man's wages is given him as a bonus, in most cases this ranges from 20 to 25% of his day rate wages. Starting at about 70 or 72% efficiency the workman is given

a certain percentage of his wages up to 100% when he gets 20 or 25% and then continues on from 100% efficiency adding one percent bonus for each additional percent of efficiency so that at 120% efficiency, if a man could make it, he would get 40 or 45% of his wages as bonus.

Furthermore, after having selected a time in which a good, normal workman can do a piece of work, we must allow for fatigue and for interference. Fatigue allowance ranges from ten percent of the given time, up; in some cases, it is less than ten percent but I think these are rare. I have seen instances where as high as fifty percent was allowed.

Having established a fair time for doing a job, it is next necessary in some way to get the data in shape so that it can be used. In many instances time is allowed for the job by the planning department or the dispatching clerk or whoever sends the work out into the shop, and I think that has been one reason for a good many errors in the application of standards, the fact that these standards have not been given to the man who applies them in such shape that he can utilize them accurately.

Classifications

The matter of classification is quite an important problem. It might not seem so very great in the case of an operation where a time study man goes out on the job, makes a study, sets a standard and gives the man the total time for doing that job, but take, for instance, a repetitive proposition or a machine which works constantly on varying classes of work and you have a situation where time data has to be presented in such form that it can be used.

I have in mind, for example, the case of a sheet shear, a shear with about a twelve-foot knife blade for shearing sheets such as we carry in our warehouses. We receive orders for sheets in every size possible and of every description. They may be cut in a small disk, they may be shaped as a triangle, they may be in rectangular form or square; they may simply be a stock sheet with one end cut off; one of any number of conceivable combinations of cuts are possible. It was difficult to establish standards on work of that sort because you must know that we are passing through perhaps a hundred orders a day to that machine. One of those orders may call for 100 sheets of a given size and another order may call for just one little sheet. We had, in some way, to classify all of the minute operations and present a table to the planning department so that when an order came through for a particular sized sheet the estimator could refer to this table, see what classification that particular sheet fell into, select the time and apply it to the job. In many cases the time allowance would not be more than a minute and a half. These machines are working all day long, mind you, and their work is simply a total of a large number of such jobs.

The important thing in this case was to make certain that we had the right classification of time because it would be very simple if our classifications were not worked out very carefully for some one to throw into the wrong classification a large order of sheets and allow fifty per cent too much time or perhaps only seventy-five per cent as much time as should be allowed.

We have now had these particular shears that I speak of, on an incentive wage basis for about twelve years; our costs have been kept to a minimum and far more important—we have been able to deliver service far greater than we possibly could before, largely because of the incentive that we provided. These operators month in and month out do not vary in their efficiency more than five or ten per cent over a total month's work, but you can see that we had to classify our time data very accurately on such miscellaneous work in order to get that result.

Time Study Men

I just want to speak for a minute or two longer on one other phase which perhaps does not have to do with the details of setting rates but which I think is vitally important, and that is the question of who is to handle the rate setting. I was talking before the Western Efficiency Society a few weeks ago on a subject similar to this and afterwards in the general discussion some one in the audience asked why it was that so many concerns employed youngsters, clerks out of the office, inexperienced men as time study men. I wasn't in a position to answer that but it seems to me that when done, it is a mistake. A skilled man, a man who knows the job that he is working on, that knows the plant and can command the confidence of the men, is required in order to handle satisfactorily the work of setting rates; it is a problem in industrial engineering, it is not a clerical proposition, it is not a simple little task of figuring out a mathematical problem. If the rate setting function is given the importance that it deserves it will be considered in that light, and whether the plant is large enough to retain an industrial engineer for that purpose or not certainly some one within the organization must acquaint himself with the principles and the best practice in order to handle it satisfactorily. I think that is a fundamental.

I want to conclude by pointing out that the proper setting of rates affects four very important things in the conduct of any business—Costs, Profits, Relations with the Men, and Production Service. It has a tremendous influence on all of these four things and accordingly it seems to me it deserves our careful attention and the best thought we can give it. (Applause)

THE CHAIRMAN: As I said before, we want to make this a meet-

ing for general discussion. We want to hear from the small shop man as well as from the large shop man. We want to hear about various problems in connection with instruction cards and rating. We don't want to confine our attention to piece rate setting or any one kind of rating. There are a lot of them—piece rating, bonus, competition, and various methods all of which have shown up well in various plants.

I hope particularly we may get together on this and that persons will speak freely of even small details which they have worked out, in the way of getting results in their particular factory.

I think Mr. Bryant will be glad to have questions asked in reference to his paper and then we would like discussion on various other topics in reference to rate setting and instruction cards.

MR. E. J. LOWMAN (Montour Falls, N. Y.): How much consideration in setting a time when using a stop-watch should you give to past performance in determining what time this was set on piece?

MR. BRYANT: Past performance as indicated in records?

MR. LOWMAN: Yes, time cards and time actually taken to perform the work.

MR. BRYANT: I should give considerable attention to that, in order especially to determine whether or not a man is soldiering or whether he is working at his accustomed rate. If he is not working at his accustomed rate, then he is either speeding up or he is soldiering and I certainly would use records as a method of determining that.

MR. LOWMAN: In case you had a man you felt was soldiering and you had taken several readings on the same operation and none of them corresponded to any great extent, say one was fifteen, the next one sixteen and one nine and another twelve and another eighteen. Do you take into consideration the extremely low ones or the extremely high ones or the average ones?

MR. BRYANT: My experience has been that a man when he is deliberately soldiering will at one time or another forget himself and work at his accustomed rate. That sounds perhaps surprising but it is a fact. I have tested it out and I have found that by watching carefully you can catch it; but there is one other thing, the possibility in some cases of applying a different workman on the job, though I don't like much the attitude assumed in such a procedure. It has always been my thought in the first place to get the workman into our confidence, to make him feel that we are not going to set any rate at all until he does the right thing, and that he had better come across clean. We have made it a practice for years never to cut a rate under any circumstances, unless it was merely an adjustment required because of changed conditions, in which case, in every

instance, the workman has agreed that it was desirable and necessary, and because of that I think we have had perhaps a unique experience in that the men have always contributed very largely to the work of making the studies; they have helped out and they have cooperated and there has been very little soldiering. I don't recollect in the past five years more than four or five such cases and they were the instances of new men and in every one of those cases we surmounted it by one of the steps that I suggested.

MR. LOWMAN: Did you ever have a man ask to have his rate lowered?

MR. BRYANT: No, we have normal men at our plant. (Laughter) I don't like, though, to say that that feeling is not existent, because I have time and time again had men ask why we hadn't come around to change the rate; they knew it was coming, knew that the changed conditions or new equipment we had put in had altered the conditions and perhaps we had been so busy on other things that for a few days we hadn't been able to get to it and they inquired why it wasn't done.

MR. E. E. FAST (Cudahy, Wis.): I would like to ask you a question in regard to how you get the cooperation of a man to work, as you think he should work, to give you the proper time.

MR. BRYANT: I wouldn't like to take credit for personally getting the cooperation of our men, because I think that there is something broader and deeper than that as a basis for it. I believe that the principal reason why we get the cooperation of the men is that they, to a large extent, have pretty good faith in the management. For years and years the management has been operating along these lines and there is a growing feeling that they are going to be dealt with squarely, and accordingly there is very little tendency to go the other way; but there have been some such instances, and whenever a man is intelligent enough, I mean by that where he is the type of man who can understand what the whole thing is about, I think it is well to take the time to sit right down with him and explain the whole proposition and put it up to him squarely that no rate will be set unless we are assured that it is right or nearly so. Where you have the case of an ignorant worker, such as a common laborer, a foreigner, whom it is impossible almost to impress with anything, it is a rather difficult situation. About the only thing you can do there, is either substitute another workman or get his cooperation through the medium of the other men, that is, get them to impress him with the necessity of it and that has been done in a number of cases.

MR. SILCOX (Milwaukee): May I ask on what basis you set your rates and how do you check them up?

MR. BRYANT: I think you have in mind this matter of classification that I was talking about. That brings out the very thing that I was trying to emphasize—the importance of classifications.

We have found that every individual instance required analysis to determine what was the proper classification basis. For instance, take this example of punching. We punch beams, channels and plates principally and they may be anything from sixty foot stock lengths down to pieces about a foot long. We have classified out time data first according to the commodity, that is, according to beams or channels or plates; secondly, according to size which makes a big difference in the handling conditions; thirdly, in relationship to the spacing of the holes, because that makes a big difference, and then apply a time per hole after arriving in those various classifications.

MR. SILCOX: How do you check up the number of holes punched? You have got to have some method of accounting either before or afterwards and who is responsible for this check?

MR. BRYANT: We handle that in our planning department. It is easy to calculate, having the drawing for the structural material and knowing how many rivets, or bolts in some cases, are to be placed. We can easily calculate the number of holes and pieces.

MR. A. B. SEGUR (Chicago): Mr. Bryant has handled his angle of the subject very, very well indeed and I will say to Mr. Bryant that as far as he and Mr. Gilbreth being very far apart I don't think they are any distance apart at all. I think it is very largely a question of the comparative values rather than any question of difference in principles involved.

In working out our own methods and our own standards I want to place clearly before you the condition under which we work so that you may be able to judge for yourselves as to the utility to your own affairs and your own business.

We have a laboratory located in Chicago in which various manufacturing problems are placed by manufacturing concerns. Our clients vary all the way from the small man with one or two thousand dollars and a good idea that has merit, up to the large million dollar corporation that comes with a problem having to deal with a specific operation on which they wish to reduce the cost.

Then, of course, in addition to that we have our field engineers, who work in the plants of corporations themselves.

The idea of a laboratory, is entirely one of eliminating completely any experimental work on the production floor. We don't believe, where it is at all possible to take any development off the production floor, that such work has any place on the production floor.

Needless to say in a varied clientele of that sort, we have to do some manufacturing of our own, because a man will come in with a good idea and a sales demand and have but very little money. In many cases, we have to furnish desk room in which to carry on his business for the time being, so that this manufacturing will vary all the way from a case where there is only one or two simple pieces to be assembled, up to the man who is making very highly specialized and very fine working automatic machinery that will run as high as 1200 pieces to a machine, and the size of the jobs handled may vary all the way from \$100 up to a million dollars.

Now, we believe that there are three or four principles governing very largely the method that is to be used in setting piece rates or in handling instruction cards in the development of machinery methods.

The first method that I want to lay down to you and get it across if I possibly can, (I expect two-thirds of you will go out with your own idea but I will have to chance that) is that the quantity of material involved, governs entirely the method that you are going to use in setting your piece rate.

The second principle is that calculated time studies from no elements are much more accurate than supposed time studies where the time and mechanism are not accurate enough to catch the essential lost motion in the operation.

The third, wherever calculated time studies are used from elements, then a synthetic stop-watch study or hour study or day's production study must be taken, to check up on the combination of the elements that enter into the job.

The thing that is back of those elements is very easily determined. In the first place you take the question of a careful stop-watch study. For instance, here is a job that a man works on for one or two months out of the year. He may work four or five hours a day on that job. You can't go out and simply pass it by the board, because the average shop has from seventy to ninety per cent of its entire production taken up in that kind of work, so that you have got to get some sort of a standard. On the other hand, you set out to take an accurate stop-watch time study that isn't worth the paper it is written on and you are going to spend from fifty to one hundred dollars in wages and overhead at the very best you can do, unless you have better type of men than I have been able to get. You can list the elements that enter into that job and with known standards can add them up at a cost of three or four dollars and it is a very serious question in my mind as to whether anything that you may gain from taking the stop-watch time study is sufficient to pay for the added cost of the study.

We have been able in our own practice to get some very close work on calculated time studies. We have one operation, that runs into millions each year, where the estimate given in November, 1919 as to what the final development of that operation would be, was one hundred and nine thousandths of a minute per assembly as the maximum of an operation on that job. It required eight months of experimental work of the hardest kind to put that job through. When we took hold of the operation it covered a space about half as large as Plankinton Hall and when we got through it required a table about the length of this room and perhaps out into the hall. When we got through, the time required was one hundred and seven thousandths of a minute. Where we have had the right people to make the calculation, who thoroughly understood the condition, I never yet, in checking up with a stop-watch against a calculated time study, found a single instance on hand operations, where the calculated time study was not more accurate than the stop-watch. I know that will have to be taken with more or less reservation. It depends a great deal on the person making the calculation and that person has got to know his business. He can't be any Tom, Dick or Harry that you can pick out of the office and send out there. He has got to have analyzed enough operations to know what he is talking about, because unless the original elements and calculations are correct, the final results, of course, cannot be correct.

Now, you have another line of work in which I would say that the stop-watch is practically the only method. That is the line of work I think applies very largely to Mr. Bryant's plant in Chicago, where a large part of the work involved is a question of how fast the machine is going to work. Now, you, of course, have the R. P. M. of your machinery and you have a great deal of other data of the same kind, but to calculate that out mathematically for the time for each whole or for each piece, unless you are making up your original standards, is a tremendous job, and when it comes to cutting speed of lathes on operation, that doesn't amount to much so that you can't go into the question of feed speed, etc.

When you have added up these elements of time studies and gotten your standard, the next question comes in as to how you are going to make use of those elements. I am a very firm believer in giving to the workman, when he takes a job out in a shop, full instructions as to how that job is to be done. Again the question comes in as to giving instructions according to how much the job amounts to. On a job that runs for only a day at a time, I would say that the drawings, (if it is on a machine or in a machine shop, with a sketch of it set up) with a complete list of all materials required for that set up, and by all means the materials themselves that go to the man on the machine must be supplied, so that that

man is not compelled to go over to the stock room to draw a bolt or a nut every fifteen minutes. On the other hand a job that requires enough for four or five or a dozen operators working the year 'round or where a fifty or sixty per cent increase in output is a tremendous item, then nothing less than a motion picture is worth while at all, because it is an impossibility for any certain operator to teach any one else how to do the job by doing it slowly himself. Take a job, any of you, with which you are most familiar and do it slowly, and you will not make the same motions at all. You will not even write your signature the same when you are writing very slowly that you do when you are going at normal speed. Now, if that is impossible on a thing that you are most familiar with, how do you expect this foreman to try to teach this operator to do the job by doing it slowly. It can't be done. Now, in that case, of course, you come down to your motion picture instruction, or some other form of suitable instruction that is equally as good.

To take a high speed study, where you are running tremendous quantities or fairly large quantities, say three people the year 'round on a certain operation, there is nothing less than a motion picture machine that will do on that job at all.

In nearly every case that we have tested, the lost motion that the stop-watch cannot catch is far greater than the lost motion the stop-watch can catch in the most inefficient operation. Now that may sound funny to you, but you take a familiar operation, where the same thing is assembled over and over and a fairly high speed is developed. You lose a hundredth of a minute in that job, and it doesn't take very long until the lost time in hundredths amounts to sixty or seventy per cent of the entire job.

I think practically all of our clients, who are making use of the development of high speed operations, have already very highly developed and very efficient time study departments of their own—stop-watch time study departments—and so I don't think that any of the results accomplished in the laboratory there can be considered due to inefficient plants in the beginning, yet the increase in output due to eliminating those hundredths that are below the stop-watch has been great.

I believe firmly in putting all this information on the instruction card. I believe in putting the time required, or your standard time as you may call it, on that instruction card. I believe in putting on there a full list of all materials required on the job. I believe in putting on there the sequence of each particular operation where it belongs and the general scheme of the whole machine that you are assembling. I believe in putting every darned thing on there that I can think of and let everybody else check it over to see what he can find that I left off, because the very thing

you don't put on there, nine times out of ten is the thing that is needed to make that job go through the shop right and when you get it all on there, then you are sure you have got it and it doesn't require a very large card either. We have been able to get the cost of writing up these cards with all information as to order numbers and everything, down to three dollars per thousand. I think you will find that the cost of writing up the complete card with all the requirements required on it, is far less than keeping up any of the so-called modified systems that have been put up so as to save the cost of running cards. There isn't much cost there, and if you have all of the information in proper form on your card, you enable your planning department to reduce a large amount of its work to a simple filing operation which you can, in turn, study for the method of development of operation and cut the cost of handling the cards and your cost system and pay roll down to a minimum.

As an illustration of what can be done on this item, I have seen the pay roll checked with the cost system, and our friend Mr. Myers back there has seen that same thing several times, for 18,000 men, checked accurately with about ten men in three days. Now the whole thing is, that there is a standardization of those particular operations and if your card is complete enough, in almost any shop (that is, anything outside of the ordinary custom shop, that has a different job every day and no repeat orders) you can reduce your cards to that at a very small expense. The thing comes down again, gentlemen, to applying the principle that you are using on the machine to your own work. Find the best way of doing the job, tell the operator how to do that job and then bring about the conditions in your own department to a point that you are able to give this information yourself in the one best way, and you will find if you do that that the cost of your department to your management is not going to be considered a very high item in the overhead account. (Applause)

MR. J. H. ROBERTS: (Federal Rubber Co., Cudahy, Wis.): How do you determine the one best way?

MR. SEGUR: You give me some operation most of them are fairly familiar with. Now, winding tires I know myself but most of them don't. You have some assemblies there of tubes, haven't you? Most of them understand those little valves. How many parts in that valve?

MR. ROBERTS: About three.

MR. SEGUR: The parts are screwed together. The way we do that is to start out first to determine whether we did have the one best way and that would be to set a standard on that operation as to what we should accomplish before we had the one best way. We never, on highly repetitive operations that are going through as a matter of daily routine, attempt

to reduce the time required below the full time of one operator throughout the day.

Here is a job that requires three operators working on that job the year 'round. This operation is required to be kept going in order to match up in some other department. If there was one method which would enable one operator to do that in half a day and another method which was cheaper, a little cheaper in first costs, which would enable one operator to do that in the full day, we would choose the second method always. The reason of it is, of course, that the first cost you always underestimate and you choose the easy method of doing it so as to be sure that you get your results at a cost within your limits. After you get below the time required for one operator full time, the same is required for doubling up the output per operator. Now that is the first standard.

The second standard, we would take in your case, and we would say that one operator very probably under the very best conditions can assemble those pieces at the rate of about 8,000 per day. The thing that we would then do would be to check up, if we were not going to use the picture, understand, the job of so handling our individual parts, that, when these elements go together they will go together at the rate of 8,000 per day. Now when we get up to 8,000 per day, what the other fellow is going to gain over us is not going to be enough to make us worry very much, but if one of the foremen or somebody in the shop or outside should gain one over us on the thing, all we would do would be to take his method and put it in the shop and call that the best method.

I will give you an illustration of how far we would go on those things. I was down at my office this morning before I came up here, and we had a job of assembling electric heaters and the standard had been determined upon this thing. We had our mechanical designing engineer, drawing up fixtures and the machinery required for assembling these fixtures at a certain rate. He came around and said, "Well, you can't keep this operation flat with the table; we can't get our mechanism in there". I went over the thing to see what he was getting at, and I told him that that might be true, but the operation had to come flat with the table, I didn't care how much it cost. Why? Because we can go right back to our charts where a similar operation was being handled on another job and the time required for picking up one nut from the top and carrying it down and putting it into a funnel such as he would have there was two one hundredths of a minute, while on a similar operation on another job the time required for handling it on table level was four and one-half thousandths of a minute. We had enough operations in there that irrespective of the cost we couldn't afford to raise that thing half an inch above the table. Coming up here

I thought of a scheme of doing it and I called him over long distance and told him I had it. He said, "I had that two hours ago". In other words, he couldn't do it until he found what he had to do and I think that is what you find in the general case. Get yourself in the attitude if you are developing mechanisms for your plant that you are going to get the maximum standard for yourself, you are going to attain that standard and after you have set that standard then don't let anything swerve you from that if your standard is within possibility and if it is within economy at the same time. It may be a hard pull, it may make you lie awake at nights for a while, but you will get over that.

I am afraid in many cases we get to the point that we are so busy setting standards for the other fellow, for the machinist and for the man out in the plant, that we forget that it is just as wise to set a standard for ourselves once in a while, and to hold ourselves to those standards, because if the discipline of standard setting out in the plant is a good one, why isn't it a good one for us? Why not take some of our own medicine in our own shop?

MR. SMITH: I would like to ask on a hand operation where you repeat it year after year at the rate of about six or eight pieces a day and the pieces consist of about 500 elements, do you use an instruction card with each and every piece that you put on?

MR. SEGUR: Absolutely.

MR. SMITH: Most of the men have done this work for six, eight or ten years and would you force them to change over to some particular method?

MR. SEGUR: The best answer to that is that nine times out of every ten if you have your jigs made for the best way of doing the job you won't have to do any forcing at all.

MR. SMITH: That is all hand operation with four or five hundred men on one operation.

MR. SEGUR: That is different. I would say that your job is very, very unusual. Where special jigs and tools would be beneficial both for the quality and quantity of work turned out, those jigs and tools should be provided and instructions given as to how to use them.

MR. SMITH: Take a case where one man will use a certain tool for one operation and if another man would try to take that same tool and do the same work he would gum the job all up. If one man has a method whereby he can work faster should we force him to the other way?

MR. SEGUR: That is one thing I am bringing up in the fatigue meeting this afternoon. I don't care to make that speech here altogether but I will tell you one thing we did do in one case. We had an operation

where a girl was handling up to eighty pieces a minute on a certain assembly operation that meant she had to pick up, inspect, fit and assemble eighty pieces every minute for her highest speed operation. Two girls were working at that thing, and one girl was faster than the other. On the other hand, the same girl was fatigued about 2.30 in the afternoon. We couldn't find out why; apparently they did the work the same way, they had a little different motions which they claimed were the best for themselves and they had pet machines. We took a motion picture of those two girls and discovered that the girl that got tired quick had her finger bent at that angle (illustrating) and the other one bent at that angle (illustrating) also in a part of the operation that lasted ten thousandths of a minute. What we did, was to take a picture of the other operator who didn't work so fast as this girl and she had this part down to perfection but was very bad on others, so in instructing new operators on this job and showing these old girls where they made mistakes we took the good piece of both of them and pieced them together as one film which is the standard instruction for all of them. Before we used the picture our first instruction required from two to three months to train an expert operator. Expert operators are now turned out on that operation so they are up to the speed of the first girls within three or four days and up to away above that speed in the matter of about a week or ten days.

MR. SMITH: That is a little different because you have got very few elements there.

MR. SEGUR: The more elements you have the more the necessity of a careful instruction on the pieces because the more the opportunity for the man to be tangled up in going through the mass of stuff.

MR. SMITH. We find that we can take a man and ordinarily get him off day-work onto piece-work in from three to four weeks, whereas if we would set down to make them do it as these experts that have been at it ten years can do, it would take months and months to develop him.

MR. SEGUR: You are just as well off to let the man go his own way in that case. It can't be done that way; unless the man who is watching is a very exceptional man as a trained observer, he is not going to see the reason why that man falls down. He simply tells him he falls down and is not doing right but why, he doesn't see, and that confuses your workman. If he undertakes to watch the other man in nine times out of ten he watches the wrong thing; he doesn't watch the real elements of skill that make for that.

Take a man pitching a baseball; the average man will watch a baseball pitcher all the time he is curling up and going through all sorts of contortions, while the vital spot of pitching a ball occurs within the last

three inches of the throw of the arm. The boy in the sand lot doesn't see that last three inches, and the reason that there are so few great pitchers in the world today is because the time required in that last three inches is considerably less than a thousandth of the minute and the average person can't see what occurs in that last three inches. Now if that is true in athletics where there is every incentive in the world—\$25,000 and \$30,000 a year to the man who is able to learn how to go through that three inches,—and where there are thousands of boys all over the country trying to get that by observation and can't, then where the incentive isn't two per cent of what it is in the baseball field and where you haven't got a carefully selected bunch of people according to interest, but people simply hired to take that job because they couldn't get another job in many cases, how do you expect them to get it by observation?

MR. ROBERTS: Mr. Smith has been talking about building an automobile tire. We have a particular job with nearly 500 different operations. Do you think it is practical for us to go that deep into it?

MR. SEGUR: You have never gone into the matter from the standpoint of standard practice, have you?

MR. ROBERTS: No, sir.

MR. SEGUR: Well, of course, the winding of tires is a peculiar operation.

How many men and what do they make?

MR. ROBERTS: About 400 at ninety cents an hour and nine hours a day.

MR. SEGUR: That gives you over eight dollars a day, say about \$3300 a day. Now if each man were able to double up his output on that job, you would have \$1600 that you would be able to gain. Take that and spread it over a year's time; you would have \$480,000 a year which would pay for lots of standard practice.

MR. J. J. WILLIAMS: If you could take Christy Mathewson's method of pitching a baseball and teach everybody else his method, that would be a wonderful operation, wouldn't it? Every man has his own way of doing things and you can't make every man do the thing the same way.

MR. SEGUR: As I said a while ago, what makes Christy Mathewson a great baseball player is not all the contortions, it is within the last three inches from the time the ball leaves the hand that determines it and that takes place so rapidly that today nothing has ever been emphatic enough which will measure that motion accurately. Now the reason you can't catch that is because of the intensely high speed.

An attempt has been made for twenty years to catch that last three

inches with the highest speed motion picture camera in existence but it has never been accomplished. It is too fast even for the motion picture camera.

I have been interested in the blind for a number of years and when I find a blind man that is able to work I try to find some work he can do. I have one blind girl down there on one job who performs 63,000 operations each nine hour day and she does it in perfect rhythm. She assembles certain parts in the electric department. It is a repetitive job but, of course, that is the reason it is possible for her to do it.

MR. ROBERTS: The question is how deep to go into that thing. Where do you stop?

MR. SEGUR: It is all a financial problem. How far can you afford to go? The further you go the more money you will save. Now, if you will work it out, you will find, of course, that five times the output doesn't mean five times the saving by a whole lot. How far can your firm afford to go to cut down the cost of that job, because, after all, gentlemen, when we get right down to it the only reason that we standardize is to make money for the firm. The firm is not paying your salary and not paying my fees or anybody else's salary just for the fun of it; if they did they wouldn't be in business very long.

THE CHAIRMAN: We have talked a great deal on piece rate. I have been wondering whether there are any people here who are interested in anything but piece rates? I know a good many people in Philadelphia who are paying by the hour but looking for some incentive method where piece or bonus-work does not seem applicable.

I would like to see a show of hands of those people here who are not using time study with a stop-watch in their operations. (No hands) Are there any persons interested in that end of it? It seems to me that this is pretty much of a stop-watch crowd, isn't it? I think we had better adhere to the subject of the stop-watch.

MR. WILLIAMS: That doesn't mean it is the best method, though.

THE CHAIRMAN: No. As in the case of our Company, we are not using stop-watches; we are using time study in another way. It doesn't mean that we do not believe in time study by the stop-watch or by the moving picture method ultimately. We do not think it is applicable at the present time to our Company's work.

I have gotten a few facts together in reference to our rating scheme in The Leeds & Northrup Company, Philadelphia. We make scientific instruments, particularly electrical instruments—pyrometers and steel heat treating furnaces electrically heated. We make about 450 different kinds of instruments. Into those instruments go over 10,000 different kinds of parts and most of the parts are made in relatively small quantities. The

instruments are made in lots of from one up to a dozen and you can see that it is a little difficult to apply a piece rate to that sort of work.

I want to go back to Mr. Bryant's statement, the improvements of conditions and methods before any rate work is started. That is to me most important.

We have seen to it that the control department, the employment department that makes the final records, the shop engineers' department and the drafting department are all ready with their data before the work is started. We first looked at this from the engineering standpoint, perfecting our drawings and specifications and getting all material listed on the instruction cards. We have all those things I think on our instruction card of which Mr. Segur spoke. Time study of jobs is done by an analysis of jobs that have been done a great many times. We list each operation and how the operation is to be carried out and the time to be spent on it down to tenths of an hour only. We have the inspection as to sizes, appearance and so forth. We have a complete drawing of the part which we set before the man, so he will know what he is going to make.

In our rating we have used the shop engineers' department for the setting of the rates. Our time study man makes an analytical study of the job; he does not use the stop-watch although he does time operations in certain instances. We have the very bad habit of using past records which Mr. Bryant so decries. We have found that to be the quickest way to get a start in the thing. We have taken dozens of records and gone into the individual operations; we haven't merely guessed at the whole manufacture of the article. We then show the workman on the instruction card and on the order slip which goes out into the shop every operation that has been done on the piece with the time allowed for each operation, per hundred parts when we are making standard parts, per instrument when making instruments.

The shop engineer has a series of cards called labor cost cards on which any one instrument or part has all its operations set down with standard times. When a job is closed out, the actual time of every operation is transferred to this card to be compared with the estimated time. When a great number of those actual jobs are transferred onto this card, the record furnishes a good check against our estimated time.

There we come up against another proposition with which Mr. Bryant will not agree. We reduce our rates at times. However, when we do reduce the time of an operation, we take the operator into the discussion with his foreman and the shop engineer. We reduced an operation last week where the estimate was grossly in error, fifty per cent off. That is something you will run up against in our system once in a while. The

operator and the foreman, the rate setter and myself sat on the job and the person who carried the operation through suggested the time should be not more than half of what was allowed. The foreman had suggested a little more than that; I suggested a little more but the operator himself thought the real time for that operation should be not more than half of what was allowed for it. The reason for that is that we are treating our operators fairly and they come back fairly on the proposition. It is not yet a mechanical system that cannot be changed.

On our Summary of Labor sheet we have all the operations summarized for a job with the savings in hours, the number of hours taken for the whole job and those figures are then transferred to a personal record card and we have a card for each person in the plant. Here is one for a girl who has about twenty jobs recorded. The number of hours she has spent on each job is recorded and the saving she has made on that job or the loss she has sustained. The total number of hours are added up for three months which is the period over which we make the rating. The total savings and the total losses are added up for those three months, the result being divided into the number of hours giving us an answer in cents per hour saved. In this case the girl has saved sixteen cents per hour over three months work.

We then have established a rating curve which gives the operator a certain percentage of the saving that he has made, which is roughly one-third, and here comes a point which differentiates our system from any other with which I am familiar; that saving is not given in the form of a bonus but is actually added to the person's rate per hour and stands there continually. That is, after a three months' period a person may have a raise of five cents per hour on this job and if they do the job again in the next three months at a similar increasing profit, they may get another five cents per hour, and their rate is again changed by that amount.

MR. BRYANT: Mr. Chairman, I would like to ask on that one point: If that person should fall down or at any time went back to the former standard, what would happen? Would you reduce the rate?

THE CHAIRMAN: We have had few cases like that. We rate, as I said, at three months' intervals. We have probably set our estimates too high but nevertheless they are the estimates based on what we have been doing in the past. We have had several cases of persons who have earned a five cent raise and have not earned anything after that. They are the ones that were laid off last fall when we made our layoff. If a person doesn't earn the raise he has made in the following three or six or nine months, he will need attention from the personnel department to see where the trouble is. We have had such cases turn up; we have found in

cases of some persons, it is physical disability; some persons have been sick and we have reached the cause of the trouble through the personnel department. That is where they come into the rating very strongly. We have not reduced any rates but we have laid off persons who were at the bottom of the scale. For instance, in a layoff which we had to make last fall the foreman recommended the persons who were to be laid off and they were compared with this list of raises which had been given during the last year, that is for the ten months ending with October. In one shop the raise of one man in that time was as much as sixteen cents an hour in a period of ten months. The least raise given was four cents an hour. In another shop the highest was thirteen cents; the lowest two cents. The persons laid off at that time were all below the middle of the list, which shows that the rating had been carried out in a manner which showed up the ability of the people.

MR. HUBBARD C. ATKINS (Milwaukee): I would like to ask, when you employ your men you figure that they are going to increase their production and get a corresponding increase in pay, and what is your policy in hiring them on their initial rate? Is it lower than the predominating rates in the field at the time or do you put it the same? For instance, supposing the rate for a certain class of men is sixty cents an hour around town, by day work, would you hire those men at sixty cents an hour or would you hire them at something less?

THE CHAIRMAN: We try to make our rates at least equal the prevailing rates in the community. In making our estimates on these jobs we divide our people into four groups—boys, girls, young men and men. The boys and girls get a rate of about thirty cents an hour; the young men forty-five cents an hour and the men eighty cents an hour, and the job specifies which class of labor shall work on it. It gives almost anybody who is taken on at our plant a good chance, if he is the average, to increase his rate. If he is above the average and learns quickly, he can increase it very fast.

There is one safeguard I have not spoken of and that is on these records we must have a record of at least eighty per cent of the time possible to work in three months, so that no man can have a five cent raise when he has **only shown** a record for a week or two.

MR. ATKINS: How much help does it take to keep your records?

THE CHAIRMAN: Three and one-half persons are used to keep the records for the production force of about 150 men, or about 1 to 50. We feel that it is worth while. Our people really have confidence in the system and this certainly promotes a feeling of cooperation in producing results.

I had hoped that there would be a number of people here today who would want to discuss a problem somewhat like this. I do not feel that it is scientific but I do feel that it is an attempt in the right direction.

I was interested on a visit to the plant of the Kearney and Trecker Company this morning, to be told that they have a system out there which they are starting up and which is more or less similar to our system. Their superintendent promised to be here this afternoon and tell us about it, but so far I have not seen him come in.

MR. R. E. MOODY (Milwaukee Electric Co.): When you asked the question about time study without a stop watch I didn't gather the real meaning of your question. I want to say that we have done quite a little work along those lines and make very little use of the stop-watch. Our system in a good many respects is somewhat similar to yours.

MR. BRYANT: Mr. Chairman, I hope that I haven't given the impression that I would not in some cases employ the same means as you have just described. There are certainly a number of special cases where the use of the stop-watch is almost impractical and likewise there are a number of special cases where in my mind the use of nothing but the motion picture methods such as Mr. Segur described is desirable, but I was trying to picture here the situation that exists in the great majority of plants throughout the country, the ordinary manufacturing concern with the ordinary operations where it seems to me the predominate method must be the stop-watch method.

I just wanted to make that explanation so there would be no misunderstanding.

MR. WM. L. ELY (Cleveland): We have lately launched out in the field of doing some time study work, and by way of explanation I would say we are an engineering concern, pure and simple. We are not a manufacturing concern in any sense of the word. When the proposition of time study work was first brought up, I had a good deal of misgivings about being able to set premiums on it. My mind is being changed over quite rapidly. I have about come to the conclusion that we can time study almost everything that we do. We are young in the game and we don't know all there is to know on the subject but we are getting some very good results.

I might mention our methods that we employ in the machine shop. We selected our time study men from among our expert operators, men with good pleasing personality and good mechanics. Those men were taught under a professional time study man. Then after a few weeks they were started out to take time study themselves. They have got so now that they can stand on their own feet and they are doing mighty good work.

While on the machine shop I might mention that before taking a time study the machine was put in first-class condition; they were all gone over, old and new. There was a report made out on the condition of each machine. Then the superintendent of the department, the foreman of that particular group of tools, the time study man and the operator made that time study; they got the concurrence of the operator in the fairness of that study while it was being made, and after it was made that standard was set and on it we stand or fall. There is absolutely no deviation in the line of deduction. We have found in a number of cases, while we have made mistakes in which the operator was placed at a disadvantage, when that is proven, there is a means by which the operator makes an application for a new time study and states his reasons; we grant that new time study but he stands or falls on the result of that second study. We may add to that time, if it is proven that it is unfair, that there has been a mistake in which the operator suffers, but we never will take anything from it no matter how bad we get stung; that is our funeral and we are going to stand by it.

THE CHAIRMAN: I would like to ask if anybody has had experience in applying time study work to tool makers' work. Toolmakers' work is rather different from most work because it is a good deal individual. In some places the actual designing of tools is left very much up to the tool maker. I would like to know if anybody has found it possible to rate that work.

MR. BRYANT: I haven't had any experience in tool making but a very similar problem is that of maintenance work. Any of you who are connected with comparatively large plants and have maintenance or repair gangs and have the problems of trying to set rates or establish a bonus system on a maintenance plan will know what I mean. It is practically the same proposition and the problem is the same, because as you say, the tool maker has to find his own way in some cases to do a job, likewise the maintenance man has to find his own way. He doesn't even know what is the matter with a motor; he has to dig into it and find out and how can we establish a rate in advance? It is the most difficult task in connection with time study work, and in that connection I think you perhaps might be interested in a conversation that I had just a few months back with a Frenchman, a gentleman who was chief engineer and general superintendent of a section of the railroads of France. He had under his personal direction about 18,000 men; he was a responsible and very capable executive. He came to this country to spend a few weeks in familiarizing himself with American methods of industrial management. He came to our plant as one point to visit and I was very much interested in the viewpoint

that he had of this whole thing. I was astounded to know that he understood so personally and minutely the methods of time study. There are a good many men of that general type who might perhaps know that there was such a thing as a piece rate system or a bonus plan but I have yet to meet with a man of his particular station, and particularly a man who has no contact with American methods, who has had such an intimate knowledge of time study procedure as that man has. He could have entered into this discussion this afternoon and have understood the various points that we have discussed and the technical details of the matter, and the particular thing that he wanted to know of me was whether there was any way that you could set standards or establish a piece rate system on maintenance work.

I was astonished to learn that over in France they had adopted practices that have been inaugurated in this country which we have been led to believe have been primarily American, which are now being taken and applied and which are being promoted to an even higher plane over there. It seems to me that there is a challenge to us in this country; while it is entirely outside of the subject at hand, it is well worth while for every one to keep in mind that Europeans are very rapidly taking over the very best methods in industrial management and applying them, and we have got to watch ourselves and have got to study out more improved methods, more advanced ideas in order to keep ahead of the game.

MR. ELY: I believe that too much importance can't be attached to learning all that we can about improving our systems in handling our work. We have seen the handwriting on the wall in connection with day work; there isn't any doubt about that in my mind, and the fellow that doesn't get into it sooner or later is going to be shoved off the map. There has got to be some system which is more stimulating than the day proposition. Now we have operated on the day work plan for years; we have never run a piece-work job in our shops but we realize that the time has come to get something more stimulating. That is why we are interesting ourselves in the premium system.

Referring to what Mr. Segur said, I don't just see how he could use motion picture machines on much of our time study work. He, as I understand it, is not in favor of this stop watch to any great extent. It takes a man four hours to go through with some of our operations, and on a unit piece a group of men will work for four days. What would a motion picture machine do with a job like that? Is not the motion picture study largely one of quick operations, where the operations are short?

MR. BRYANT: I think you are typical of perhaps eighty or eighty-five per cent of the industrial plants in America; that is just what we are

trying to discuss. I haven't any argument with Mr. Gilbreth and Mr. Segur on their methods as applied to special cases; certainly there is a field for it; there is an opportunity in some special instances.

THE CHAIRMAN: At a meeting in Philadelphia a few weeks ago Mr. Gilbreth was asked that same question, as to what use the motion picture machine would be in a job which lasted three or four days. He explained that in such a job usually a great deal of time was taken up with machine time and that the operative time was relatively small. His moving picture is so arranged so that he can take one, two or three exposures or any number that he wants in succession and he will take a certain part of the operation and wait perhaps half an hour and take another part. He will use the moving picture in it but he will not use it for the full time that the job is in operation.

MR. BRYANT: I think the important thing there, though in such a case as the operations you describe, is not largely a machine proposition. Equipment may be used, but if you actually analyzed the time, probably over ninety per cent would be manual operation. For instance, you take punching; the actual time of the punch traveling through the material is a very small part of the total elapsed time of that job.

MR. ELY: These jobs that run three and four days that I referred to are quite largely bolting and riveting structural work and practically all hand work except the actual driving of the rivets.

THE CHAIRMAN: Are there any further questions in reference to any of these points?

MR. ATKINS: I would like to know if it is foreign to the subject to have some discussion on the question of premiums, on the basis of adopting certain systems; for instance, some men object to sharing half that they gain and some men say they would rather work on a bonus. I wonder if there are any men here who have come across that difficulty

THE CHAIRMAN: That is quite germane to the subject.

MR. ELY: I might state that in our experience we have had that question raised twice, I believe. We gave seventy-five per cent of the savings to the operator and twenty-five per cent to undivided profits which goes to supervision and kindred things, but we have not had any argument with the men on that question. I think the basis that we operate under, is about as fair as any man could reasonably expect, because there are other things that enter into that, the operator isn't all; he is a big factor, it is true, but he isn't all the expense that goes into that and consequently I don't feel that he should have all the gain. It takes more power to drive your machinery, your maintenance of your machine runs higher; there are a lot of elements that enter into that that go to help produce your profits;

consequently, it seems to me rather unfair for an operator to claim that he ought to have all.

MR. ATKINS: If we put a man on piece-work and if through his own exceptional skill he improves that time on the straight piece rate basis, we give him all the share and the gain, do we not? Now then, why on the other hand just step right over and say we pay a man on standard time? For the simple reason that we switch off on standard time and say, "Here, John, we will pay you one hour for this time but if you do this in half an hour we will only give you one-half the time". I cannot see that it is fair to the workman.

MR. BRYANT: In the first place I think that reverts back to the question of determining the standard time. You possibly will recollect, in discussing that feature of selecting a unit standard, I said it depended a good deal upon what system of wage payment you were using. For instance, if I said that I would use a bonus system and at one hundred per cent efficiency, pay a man fifty per cent bonus over and above his wage rate, then I should certainly set my standard at a higher plan, shouldn't I, than if I declared I would pay twenty per cent bonus? Now, isn't it a mathematical proposition very largely? In your piece rate you are setting a standard on the same basis. You are not simply paying a man so much for doing his average, are you, unless you gauge it according to the day rate? For instance, let me make it a little more specific. We'll assume that under a day rate basis a man was turning out six of your pieces per hour and he was getting sixty cents per hour, day rate; on that basis your piece was costing ten cents, and you decided that instead of continuing on the day rate basis you would simply put him on a piece rate basis and call it ten cents a piece.

MR. ATKINS: With or without time study?

MR. BRYANT: Forget the time study for a minute.

On that basis your cost would be exactly the same. Now, then, suppose you decided that you would pay him seven cents a piece; in other words, you are asking him to increase his production there something like thirty-five per cent in order to earn the same wages that he did on the other basis. Are you giving it all to the workman on that basis? There is your piece rate proposition; you are not giving it all to the workman. It is exactly the same thing as the premium and bonus plans, is it not?

MR. ATKINS: Absolutely.

MR. ELMER MOON (Chicago): Then what is the necessity of originating the premium plan?

MR. BRYANT: The different plans are necessary in order to take care of unusual circumstances. For instance, in certain departments that

we have in our plant it would be utterly impossible to apply a piece-work basis.

MR. ATKINS: I purposely brought that up for an ulterior motive. Yesterday in a meeting in Plankinton Hall the subject of standardization was brought up. I venture to say that if we took a vote here on the definition of what we consider one hundred per cent time there would be ten different ideas of what it is.

We are a scientific organization and in bringing this matter to a head I would like to propose the following resolution:

That this group meeting suggest to the Nomenclature Sub-Committee of The Research Committee of The Society of Industrial Engineers that a definition for a standard one hundred per cent time be placed for their consideration at the next meeting of the Society.

(The motion was seconded and carried.)

ADJOURNMENT

FRIDAY AFTERNOON SESSION

April 29, 1921

Production Group

Planning Boards and Charts

Chairman: IRVING A. BERNDT

Vice Pres. C. E. Knoeppel & Co. Inc., New York City

THE CHAIRMAN: Mr. Knoeppel was invited to preside at this session but unfortunately his organization found it necessary to put him on a boat to get a much needed rest and he is now on his way to New Orleans. He has prepared a paper on this subject of Planning Boards and Charts. I am not going to read all of it, but I shall go through some of the special points and I want you to bear with me in that I am reading another man's paper and incidentally for the first time because I have not had a minute to go over it. The complete paper will be published in the official report of the convention.

"PLANNING BOARDS AND CHARTS"

C. E. KNOEPPEL

C. E. Knoeppel & Co., Inc., New York

The age of invention in which our fathers and grandfathers lived was even less remarkable than this wonderful age of production which is growing up around us—especially during and since the Great War.

The real purpose of industry is to supply the wants of mankind; and since true organization is constructive, it is fitting that the problems of reconstruction should be largely industrial problems.

Management is not merely a handling of routine details. It must know what to do in emergencies. It must make prompt and efficient decisions. It must not only know, but **know much**. It must have a theory for procedure, and must also know how to put that theory into actual practice.

Hence, Management requires co-ordinated knowledge—consisting of records that are based upon

Reliability

Accuracy,

Comprehensiveness,
Promptness.

Various means have been employed in the past to co-ordinate knowledge in a form which allows ready adjustment of comparisons; but by far the most successful co-ordination is by the aid of graphics.

Almost from my earliest recollections of business, I have observed that figures and statistics and forms were intelligently handled in proportion to the perception of those who used them. By perception I mean 'quick seeing'.

The motion picture is probably the commonest example of widespread acceptance of graphics; and its development is not surprising when we consider how clear and understandable is its appeal to all classes.

I have been impressed repeatedly by the importance of picturing as accurately as possible the relations of all essential facts about production: because in this way the workers' understanding is facilitated, the judgment of sub-executives is clarified, and decisions on the part of executive management are expedited. When these three results are reached, the various factors of production may be developed more efficiently.

Nobody can consistently claim that there is anything new, or mysterious, or untried about graphics. Some familiar examples are:

The face of your watch;
The sun dial;
The compass;
The theater diagram of exits and seating arrangement;
The thermometer;
The gage glass;
The yard stick.

These are only a few familiar everyday uses of graphics with which we are all familiar.

...

In all probability, the beginning of graphics in industry came from the free-hand sketches of shop work to be done, whereby the customer explained his needs to the salesman, or foreman, and which the foreman passed along or repeated to the workmen. As engineering science developed, this sort of sketch grew into modern mechanical drawings as the best means to insure accurate following of required dimensions. These modern drawings make use of conventional representations to show absolute relationships: and because the symbols are standardized, a drawing can be prepared in one place and sent thousands of miles away there to become a guide for precise construction. Models might give the same ideas, but they would be very expensive and the time required for their prepara-

tion would be infinitely greater than the short time needed to make drawings and tracings that will answer the same purpose.

Seeing the convenience and usefulness of the graphs in the shop, it is not strange that other departments have made use of similar aids.

(a) Today the accountant and the sales manager supplement their masses of figures by means of graphic charts:

Expense ratios;

Trends of Costs;

Effect of credit policies upon volume of business;

Potential demand;

Comparative accomplishment in various zones or sections;

Relative popularity of different products as regards repeat sales;

General analysis of conditions which assist in forecasting future expectations;

—such are a few of the ways in which graphics may be used to bring before directors and high executives the quick and complete understanding of current happenings which will facilitate judgment about prospective decisions.

(b) Railroads were among the first of the public utilities to make use of graphics. Railroad operation through semaphores and other signals uses graphics effectively. New York's development of the 'Traffic Cop' and more recently the colored-light street traffic system is a modernized variation of railroad yard lighting. No doubt lights or semaphore arms will be increasingly used in other busy cities.

A very recent regulation on the Pennsylvania Railroad's 'Congressional Limited' divides the dining car capacity into four successive sittings of 45 minutes each, in order to avoid the usual waiting line.

(c) The plotting of daily progress upon ocean maps has long been accepted procedure on shipboard, wherein dead reckoning is checked by solar observations.

(d) Both military and naval movement during the war were compactly and vividly shown by graphs.

(e) Technical journals have multiplied their value to the trades by frequent graphic showings of various data and ideas. To some extent, all books and periodical illustrations are used as graphic aids to understand the text.

(f) Advertising has learned the value of showing a map giving location of service stations or branch houses, so that no time need be lost in sending requisitions and complaints to a more distant office.

(g) The broker's quotation board allows fluctuations in stocks to be followed instantly. More recently 'market letters' of the financial houses

have made use of graphics to illustrate cycles in rising and falling prices. Babson's and similar reports depend largely upon graphs to compare present and past conditions and trends. (Have you ever heard somebody read from a financial or statistical statement and almost unconsciously reached out your hand for the document, so that you could see it for yourself?)

(h) The steam gage in a boiler room; the gas meter and watt meter in your house—these are other common and convenient graphic presentations.

We have thus had ample basis for the wide development of graphics to benefit industry.

Can you imagine anything more definitely graphic than music as written, with its exact denotations showing tempo and duration of respective notes? So accurate is this scheme of graphics that discovery of a composer's manuscript allows an orchestra to play the composition without difficulty because of the standard graphics employed. Surely no mere words or descriptions could accomplish such a thing.

The outstanding features of graphic control as an objective of industry are:

(1) **Simplicity.**

Shop workers find the simple, comparative chart more fully and quickly informative than an array of facts and figures about the shop. Even an elaborate chart can be made plain by segregating it into distinguishable elements.

(2) **Compactness and Comprehensiveness.**

In advanced practice, graphics can be made to show facts concerning a whole department, or even an entire plant in miniature.

(3) **Vividness.**

Because of the exceptions and variations from schedule that call most insistently for executive attention, well designed graphic charts fairly 'shout' their messages as warnings to immediate need of action. The very long line, or or the very short line, will attract attention instantly. This is necessary in order to gain the advantage of anticipations as well as of current progress. Indeed, these features are basic in the philosophy of graphics, because, while history of work is essential, prophecy is no less desirable. Thus graphic control of material shows both progress and anticipation. If needed material is on hand, it appears charted. If delayed enroute, or otherwise unavail-

able, the graph shows how many hours' supply is thus held up. If not yet ordered, the omission is brought out forcibly.

(4) **Ease of Operation.**

Clerical workers can maintain graphic methods to better advantage than superintendents and foremen, and thereby leave such executives freer for the direct supervisory work which is more important. It is a notable advantage of graphics that it leaves executives 'free to think and reason'.

The scope of graphic control is almost limitless, while its ideals of graphic control may be broadly stated as,

- (1) Determination of equivalency;
- (2) Attainment of equivalency;
- (3) Reduction of idleness;
- (4) Reduction of spoilage;
- (5) Determination of costs;
- (6) Service to trade;
- (7) Profitability of work;
- (8) Keeping departments and materials in balance.

To assist co-relation, it is advisable to put forth all the comparative facts in the same graphic if possible, rather than by a series of detached presentations.

There are eight chief elements in Graphic Control as applied to production.

- 1 Plans and instructions
- 2 Raw materials
- 3 Labor
- 4 Equipment and tools
- 5 Supplies
- 6 Assembling of unit-parts
- 7 Supervision
- 8 Movement of work-in-process

1 **Plans and instructions**

Lacking these may indicate:

- (a) No order has been received;
- (b) Order is incomplete or not understandable;
- (c) Order as received requires modification;
- (d) Doubt as to quantities to be made;
- (e) Drawing, blue prints or detail sketches not available;
- (f) No instructions as to auxiliary tools.

2 **Raw Materials**

Lack of these may indicate:

- (a) Insufficient quantity;
- (b) Unsuitable quality;
- (c) All available material specified for other orders;
- (d) Expected material whose receipt is delayed;
- (e) Error in inventory as to quantity or quality available.

3 Labor

Lack of this may indicate:

- (a) Temporary absence of workman;
- (b) Inability to obtain substitute;
- (c) Emergency absence through accident;
- (d) Voluntary absence due to Trade Union influence;
- (e) Absence as result of sickness or dissipation;
- (f) Inability to engage right kind of labor for the work-in-hand;
- (g) Inability to train labor to keep pace with business growth;
- (h) General labor shortage in vicinity, or in the trade.

4 Equipment and Tools

- (a) Scarcity due to breakage or improper condition;
- (b) Insufficient supply;
- (c) Failure to anticipate special requirements of the job;
- (d) Congestion at machines due to break-down delay;
- (e) Congestion due to unnecessary use of preferred tools;
- (f) Failure to make repairs promptly;
- (g) Failure to balance material flow or work-in-process.

5 Supplies

Lack of these may indicate:

- (a) Supply item out of stock;
- (b) Inability to purchase;
- (c) Enroute delay of purchased item;
- (d) Error in quantity or in inventory record;
- (e) Insufficient storage space.

6 Assembly of Unit Parts

Lack of Assemblies may indicate:

- (a) Failure to receive parts-in-process;
- (b) Foreman's failure to assign workers to the task;
- (c) Failure to receive necessary supplies;
- (d) Delay in receipt of instructions.

7 Supervision

Lack of this may indicate:

- (a) Too much clerical work required of Foreman;
- (b) Foreman too much occupied by inspection duties;
- (c) Foreman's inability due to instruction of new help;
- (d) Failure to appoint necessary sub-Foremen.

8 Movement of Work-in-Process

Lack of progress may indicate:

- (a) Material congestion through carelessness;
- (b) Waiting for move-orders;
- (c) Error in move-orders;
- (d) Waiting for inspection;
- (e) Shortage of help;
- (f) Needed facilities not available.

It is easy to criticize shop management for shortcomings—but criticism alone will not correct faults. The important thing is to know **why the fault occurred**, so as to plan means to lessen the risk of recurrence. Thus by placing graphically before executives who are responsible for profits (or a lack of them), they can readily discern the reasons for unsatisfactory conditions, there is less temptation to 'pass the buck'.

We all know how many questions can arise about an order; but not all of us have learned how much information **concerning each order** can be afforded by graphics: viz.

- 1 Priority of order, if any, over regular sequence;
- 2 What special variations from standards, as to
 - (a) Design
 - (b) Material
 - (c) Workmanship
 - (d) Purpose

Graphics can tell of the product:

- 1. Are designs and full instructions ready?
- 2. Are all tools known to be on hand in good order?
- 3. Are all necessary materials available?
- 4. Has specific equipment been provided or scheduled?
- 5. Is necessary labor available, and sufficiently trained?

Graphics can describe progress:

- 1. Were all preceding operations finished on schedule time?
- 2. Will any preceding delay prevent starting next operation on time?
- 3. Have recent operations of same sort been running up to or behind schedule?

Graphics can explain cause of delays:

- 1. Insufficient instructions;

2. Lack of materials or supplies;
3. Absence or slowness of workers;
4. Shortage or insufficiency of tools;
5. Non-receipt from preceding operation;
6. Breakdown of equipment;
7. Error in processing preceding operations.

The war took several "leaves" from the book of big business. Indeed, it was a war of 'specifications and blueprints'. Before any move was carried through, yards of charts and diagrams might have to be made to prevent misunderstandings. The symbols chosen were both simple and ingenious. For example:

- A Ship symbolized a port;
- A tent symbolized a camp;
- A white cross symbolized a rest station;
- A black cross symbolized a base hospital;
- A coffee pot symbolized a coffee station;
- A locomotive symbolized a repair shop;
- A freight car symbolized a car erection site;
- A bumper symbolized a railway;
- An ax symbolized a forestry camp;
- An airplane propeller symbolized an aviation camp;
- A bursting shell symbolized an ammunition camp;
- etc.

Returning to consideration of industrial uses of graphic control, we may note that only four control factors are present in turning out a product:

- (1) Arrangement of plant equipment;
- (2) Production methods;
- (3) Shop transportation or movement of work-in-process;
- (4) Labor.

There are four functions in graphic control:

- (1) Responsibility for planning, routing and scheduling of production details;
- (2) Co-ordination of work among departments of engineering, purchasing, costs, tools and manufacture;
- (3) Work in conjunction with various departments of the business;
- (4) Acting as 'clearing house' for all necessary production data.

Mechanism of graphic production control usually consists of part or all of the following devices:

1. **Charts**, showing past and present conditions; tendencies as

regards future; essential information of general character used for reference purposes.

2. **Progress Charts**, to secure order control by combining with order requirements, to show conditions and present status of all orders.
3. **Material Charts**, showing flow of essential materials.
4. **Control Boards and Charts**, showing pictures in miniature of the department or plant, so as to control the plant by equipment-units or working-places.
5. **Dispatch Boards**, furnishing control of labor through points of contact between control boards and working-places.
6. **Production Dials or Charts**, operated in view of the workers to show them (as well as the Management) how closely the hour-to-hour progress compares with established production schedules.

Without any wish to lay claim to especial personal abilities, I am of the opinion that the earliest form of industrial chart was the 'angle-graph' which I developed something over ten years ago, and which has been continually used since then by many different industries to show actual work done co-ordinated with estimated work to be done.

On this graph, the horizontal distance indicates work done—estimated in units of accomplishment. Vertical distance on the same chart indicates 'hours of work' (or other measurement of estimate **to be done**). Joining the bottom of the vertical line to the finish of the horizontal line, makes a triangle whose hypotenuse shows the line of normal progress. Plotting daily progress by cumulative totals gives visual record of actual accomplishment as related to established or expected schedules. Thus, if any day shows the daily line going below the hypotenuse as drawn, the work is shown to be behind schedule; while if the daily line rises above the hypotenuse, the accomplishment has been better than the schedule. When no progress is made for some considerable time, a code letter or symbol is inserted to explain cause of delay. By calibrating vertical and horizontal space, comparative completion-percentages can be computed as often as desired.

Among the various modifications of the angle-graph which have been developed are—

- (1) **Reminder-graph**: operated by symbols or colored pieces set at points along a date schedule.
- (2) **Credit-graph**: for sales department inquiries.
- (3) **Drawings-due and Drawings-finished Board**.
- (4) **Material Graph**: by which extensions to line are made as

material is received, and an **overdrawn** line blocks it out for distance equivalent to quantity assigned or scheduled.

(5) **Labor:** estimated and actual hours.

Almost every type of manufacture can be estimated and expressed in units per operation, per hour. This allows consideration by means of graphics from the comparative standpoints of

a—What should happen;

b—What does happen.

With competent graphic control, it is entirely practicable to show reasons for variations, and for each failure to perform according to schedule.

Although for a long time organized labor seemed to misunderstand the real truths about quantity production as a means to lower living cost, recent utterances of labor leaders show better appreciation of the fact that the crying need of the world is production.

Management in its relation to production must become less general and more specific. Unwieldy systems and methods which are unable to keep pace with changes in modern conditions; restricted vision; inability to carry out plans that are known to be practicable—conditions such as these result in scattered, rather than co-ordinated effect and action.

The most persistent fault, which my associates and myself find in existing industrial methods, is that they are not sufficiently anticipative in character to give the proper viewpoint as basis for planning what will be 'next moves'.

Like many another slowly developing science, the form which graphic control takes in any specific instance is less important than the following of demonstrated principles. Therefore, in placing graphic reports before an Executive, the important thing is to see that relative comparisons are accurate and logical, rather than to attempt to use some arbitrary or fixed (and perhaps inappropriate) form of displaying those facts.

Put into its briefest form, the scope of graphic control covers relations which show accomplishment compared to possibility. Not alone should we know what **has been done**, and what **might have been done**, but we should also understand the causes of every falling behind our expectations, and the reasons back of every such cause.

Just as money is the prime essential of Capital, and as work is the prime essential of Labor, so information is the prime essential of Management; it must know—

- (a) What information to obtain;
- (b) How to prove its correctness;
- (c) How best to utilize it.

These are the three first objectives of Management. How shall we go about attaining them?

If we limit the data to that which is of practical use to industrial Executives, we shall agree that

As to the **Product**, he should know—

- (a) What is to be made; and what will be most economical quantities to handle;
- (b) Component materials and parts in relation to each other and to the whole;
- (c) Whether cheapening some of those components would adversely affect utility, durability or demand;
- (d) Comparison with current products of competitors—as to quality, price and satisfactory use;
- (e) Whether distributive effort could extend demand sufficient to allow greater quantity production;
- (f) What improvements are possible in light of experience gained in the past.

As to **Organization**, he should know—

- (g) Which members possess initiative, judgment and ambition warranting their being considered for executive responsibilities;
- (h) To what extent department limits overlap or show gaps in inter-relation;
- (i) Whether the work of divisions and sections is co-ordinated to the advantage of the business as a whole;
- (j) How far current and past information of each department can be utilized profitably by others.

As to **Materials**, he should know

- (k) Kinds, qualities and sources of supply;
- (l) Time needed to obtain, and vendors' comparative reputations for keeping shipment promises;
- (m) Trend of market prices as affecting quantities which should be bought;
- (n) Extent of inventory fluctuations as they concern assurance of having sufficient to meet current and prospective needs.

As to **Manufacturing** operations, he should know—

- (o) Where to find dependable information showing what **can** be done with every piece of equipment and every process, for comparison with records showing actual accomplishment;

- (p) Current summarized information showing what each progressive step **ought** to cost as compared to what it **really does** cost;
- (q) Relative frequency and seriousness of causes which delay prompt execution of plans.

How shall the Executive obtain this information?

First, by data on technical knowledge collected from individuals and merged for general use by development into standard practice which represents the best ways to do things;

Second, by immediate knowledge as to relative progress;

Third, by cost information which is accurate, promptly available and composed only of essential items.

Steadily improving and simplifying the early forms of control boards developed by my associates and myself, we have finally standardized a thin card or strip carrying a scale divided into tens, so as to permit representing unit-hours in groups of ten.

As an example of the use of this strip, "material released" would be marked off on the scale to a length equivalent to the "hours' work" so released. Over this line would be later drawn another line in contrasting color, to show accomplishment—how many "hours' work" (expressed in material at the standard rate of progress) has actually been done.

Set on a board, with dates across the top and bottom, and with a series of horizontal spaces representing machines or "working places", relative performance can be instantly compared and understood at a glance. A plumb line, moved forward daily, distinguishes the current date.

Operation of such a board is very simple. The length of the card or strip represents the "standard time" in which the job can be done—but **shows it in equivalent hours of work** to be done. This is equivalent to charging the worker or machine with product at the standard rate of output. Credit is later given at the same rate for production actually accomplished. Any machine or worker whose accomplishment is less than the standard (as estimated) can be immediately identified because that particular accomplishment-line will not reach to the plumb line of the current day.

By use of an equipment board, and also a product board, it is easy to see not only which machines are behind schedule, but also which products are progressing at less than standard rate.

In order to make still more vivid the work-places which are non-productive, small colored markers are set in the slide at the proper point in front of the card or strip. These act as warnings or signals.

Thus, if the machine is idle for want of power, a distinctive signal will announce the fact. If no operator is available, such absence will be an-

nounced. If a machine has broken down and is awaiting repairs, we can show it by another signal. Still other causes of delay may be shown. For example, when production lags at some point, we can put a marker at a date later than the day originally estimated for completion, to show the revised estimate of completion if the present rate of production is maintained.

In a plant where one machine may work upon several jobs during the same day, we can use separate cards or strips overlapping on the scale.

Let me make plain that the operation of these boards is not at all a difficult matter, because their information deals with a common unit—standard hourly production.

The present occasion does not permit of making detailed explanations of each step in Graphic Production Control, but I am sure you will be interested in learning how the efficiency of the worker or department is ascertained.

Clearly, it is not the fault of the worker if there is no work; nor if the management has failed to anticipate a break-down which results in several hours' delay. If the supply of material gives out, the worker and machine must remain idle: but surely it is not the worker's fault. Hence, things like these must be credited to the worker and charged against the management.

By so doing, we are giving all parties a square deal, and also are in position to determine where rests the responsibility for inefficiency. This can be done by using the same mechanism of the control board and transferring the information to efficiency graphs or records for the various departments or machines or workers.

As to the Worker, there are three factors to consider—

A—The time spent in the plant (i. e. the 'shop-hours') ;

B—The work performed, credited in units at the standard hourly production rate ;

C—The time spent in non-productive effort through no fault of the worker.

Therefore,

1—In determining the WORKERS' EFFICIENCY the calculation is $\frac{B}{A \cdot C} = \% \text{ efficiency.}$

2—In determining the EFFICIENCY OF MANAGEMENT, the calculation is $\frac{A \cdot C}{A} = \% \text{ efficiency.}$

3—In determining EFFICIENCY OF THE PLANT, the calculation is $\frac{B}{A} = \text{efficiency.}$ The Plant Efficiency is the efficiency shown in (1) (2).

Let us assume that during a given week, some worker is credited with output equivalent to 29 hours' standard hourly production (commonly known as 's. h. p.'). If, during this week, the department ran 60 shop-hours of which 12 hours represented delays due to faults of Management and not of the Worker, then that worker's efficiency is $29/48=60.4\%$.

From the standpoint of Management Efficiency, the worker could only work 48 hours although he was on hand ready to work 60 hours. Therefore, $48/60=80\%$ Management Efficiency.

The Department Efficiency consequently is $29/60=48.3\%$ —which result can also be found by multiplying Workers' Efficiency (60.4) times Management Efficiency (80).

The entire showing of the efficiency record will include quite a comprehensive set of data; namely,

- Overtime;
- Absence;
- Time spent in plant (shop-hours);
- Actual hours on production;
- Standard hours' output credited;
- Delays;
- Elements in delays;
- Percentage efficiency of Workers;
- Percentage efficiency of Management;
- Percentage efficiency of Plant.

Maintenance of such a record over a reasonable period will furnish dependable answers to the following questions:

"Is the worker making the improvement he should?"

"Are his gains consistent or spasmodic?"

"Is he receiving proper compensation?"

"Is he regular in attendance?"

"How long did it take him to attain an average efficiency at 85%?"

Similarly by assembling the same information on a weekly or monthly sheet, we can accumulate the figures for the department showing efficiency of management, and also of plant efficiency. Making a composite of all department records will give us a record for the plant as a whole. Then, by working on the exception principle, we can determine at a glance which department shows the greatest workers' inefficiency, and which department shows the greatest management inefficiency. Reference to the various department charts will show which workers are most efficient in each group and which are least efficient—as well as which management factor is most inefficient.

Since knowledge of limitations is the first—and sometimes the only—step necessary before undertaking improvement, it is beyond question that these worker and management graphic charts can be used to decided advantage. It must be, therefore, that graphic control has a logical and natural appeal to Labor as well as to Capital: and if this is so, it follows that graphic control can be made a potent and equitable factor in the problems which confront us at this time, in unifying the interests of Labor and Capital through the efforts of competent and energetic management.

MR. F. M. SIMONS, JR. (Arthur Andersen & Company, Milwaukee): Mr. Berndt is one of the Vice-Presidents of C. E. Knoeppel & Company and as one of the things we want to accomplish in this meeting is open discussion, Mr. Berndt will be glad to answer questions on the paper. I am making that announcement because in the absence of Mr. Knoeppel it might be thought that the paper was not open to discussion.

THE CHAIRMAN: I think probably it will be most interesting to discuss the entire subject after we hear some of the other leaders.

As one of the leaders of the discussion we have Mr. F. M. Sawin of the Federal Rubber Company of Cudahy, Wisconsin. I will call on Mr. Sawin.

MR. F. M. Sawin (Federal Rubber Company, Cudahy, Wisconsin): Mr. Chairman, I have made no attempt to write out a complete talk, merely jotting down in my leisure time, away from the planning board downstairs, what I consider to be a few high spots which apply to this discussion this afternoon.

ADDRESS BY

F. M. SAWIN

Federal Rubber Co., Cudahy, Wisconsin

In a discussion of any subject so vitally important as the one being considered this afternoon it is well to clearly understand just what we are attempting to attain.

Today in any plant of appreciable size, some method of planning is necessary in order to have the work flow thru it in a constant steady moving stream.

The method used is usually one of three:

First. The various foremen are informed of the several orders as they are received by the sales or order department and the planning of the work thru their individual departments is left entirely to each of them.

Usually each foreman is in no way in touch with the plans of the department from which he gets work or the one to which it goes when his operations are completed.

The inevitable result of such haphazard planning is that when the parts reach their final assembly almost invariably it is found that Smith or Jones has fallen down and some important part is missing.

The partially assembled job or bill of goods is laid aside and a grand scramble is made to secure the missing part.

The inevitable result of such planning is chaos. Nothing is ever really finished on time and the organization is in constant turmoil and strife.

The next score of planning is one step better in the right direction. This method has a so-called planning department which plans and lays out the work for each individual department without in many instances providing the necessary machinery to carry out these plans.

The results obtained are of course much better than by the first method, but the plans often fail because they lack that most important feature necessary to the successful execution of any plan, mainly control.

The planner carefully works out his plans, then turns them over to the several foremen for them to do as they will with them and then wonders how things are going in the plant and *hopes* the plans work out.

The results he attains remind me of the German comedian whom I saw some time ago. He started to play on his clarinet and only succeeded in making a series of the wildest and most mournful sounds imaginable, finally he stopped and with a look of despair on his face, exclaimed, "I play it so sweet and it comes out so sour."

What would we think of a train dispatcher who started two engineers from either end of a single track road, each with a train load of passengers, with instructions to meet at a certain switch and then say, it's up to you, boys, I hope you make it?

Such a method of planning succeeds in one thing if in no other, it makes the foremen working under it most expert in "passing the buck."

The third method is one where all the plans are well worked out; this of course necessarily involves a complete set of accurate standards, where means are provided by adequate planning boards and charts to properly lay out the plans as formulated and with some method of complete control of the execution of these plans.

Such planning and control or despatch boards are now in constant use in the Tabor company's plant in Philadelphia and in many others.

The chief advantages in the use of such methods is that the necessary information must be worked out in advance of the operation and placed in definite concrete form on the boards and charts and the plans may be then viewed as a whole and any inaccuracies in the plans then usually stand out like a sore thumb and may be remedied before it is too late.

To illustrate; how often having what we considered well worked out

details for some report or proposed change, and being obliged to put it down in writing, find that our information was far from complete and that considerable more thought was necessary.

Recently I saw some production figures from a plant having approximately 2000 employees with a production last year of roughly 15 million pieces of various kinds, the time required for the different operations on which, varied from a few minutes to several hours.

Taking the average number of operations on each piece as 6 and figuring the average hourly piece work wage at the conservative figure of 45 cents, if the time per operation could be reduced only one-quarter minute, or 15 seconds the saving on direct labor would be \$250,000 per year.

This plant is rather well organized at present but it is felt that by careful analysis this result will be attained.

In any successful plant the job of planning must be done and if this is so, doesn't it pay to do it well?

THE CHAIRMAN: It has been my privilege on several occasions to introduce the next speaker. Each time it is really an increasing pleasure. A number of years ago, Mr. Simons and I were associated closely in Chicago, when he was at the University of Chicago, and also in connection with the Western Efficiency Society work. I think among the men I count him as one of the men who has given us more real contribution in his research work and in the development of the chart work, particularly, than any other. I do not know whether you have noticed his charts on exhibit downstairs. I take real pleasure in introducing Mr. F. M. Simons, Jr., of Arthur Andersen & Company of Milwaukee.

MR. F. M. SIMONS: I want to say that during hard and dreary days Mr. Berndt was one if not my best inspiration. We used to get together, a group of us—I see some more of the men here in the room, Mr. Meyers and some of the others—and argue, fight and discuss until one and two o'clock in the morning when the lights went out. I have not had as much of that kind of fun lately as I would like to have.

Unfortunately, at these conventions every one seems so busy that it is hard to get together and do constructive work, and in a way it seems that that ought to be the most important work of an organization of this kind.

Mr. Knoepfel has given such a complete outline of the use of graphics that if anything needed to be said in argument for them I do not believe I could say it because it has already been said here this afternoon.

Organization of graphic charts always reminds me of a story of Hugh Willis' that most of you have read in the Saturday Evening Post. Two coons were going along in a Pullman. One was a porter and the other fellow was a friend of the porter's who was getting a free ride in the Pull-

man. The porter was philosophizing on the work of a porter in the Pullman service, telling his friend his experiences. After a long period of interesting listening Jim looked up and said, "Say, Sam, you know a portah can sure lose a lot of ignorance in a short space of time". (Laughter)

Every time I go through a real graphic chart I lose a lot of ignorance. I think most people who work out their problems on a graphic chart are surprised at the amount of things they don't know. That same porter when he went into the train that night took a sniff and said, "There is an actress on board this car. Yes, and there is an old fellow who just returned from Cuba on this car". He ferreted out a few more people and the other fellow said, "Jim, if somebody would bang you on the nose you'd lose both yoh hearin' and yoh eyesight". (Laughter)

One thing about the graphic chart is that it appeals to one's sense. You can illustrate and get combinations of things in a way that you cannot do in any other way.

Mr. Dent asked me to make this talk. I did not know, as a matter of fact, that I was to make it until after the program came out. I tried to plead off and told him that I did not have time to write a paper and he said, "I don't want you to, I want you to get the meeting stirred up. Give your talk in a practical way from the standpoint of installation". That is what I want to try to do. It is getting near the end of the convention but I want to take up one or two things on my mind from the practical side of the chart work. In the first place I do not believe it is understood generally how much hard work there is back of any form of graphic presentation. Mr. Berndt in reading Mr. Knoeppel's paper has given you illustrations of different kinds of planning boards, etc. Unfortunately all too often the planning board is regarded more or less as a stunt rather than as an instrument for accomplishing certain things and very often it is put in too early. This is more often true, I think, when some plant man gets overly ambitious than it is a sin of the consulting engineer, but the fact remains that the boards are put in often too early in the game without some of the basic information that lies back of the board having been collected.

I believe there is one danger in such an exhibit as we are running downstairs and that is that somebody comes in from a plant and sees some of these tools which are—I want to make that clear, there is no question in my mind about the power of those things as tools properly used and that is the reason I feel that the warning is necessary—powerful instruments, powerful for good or powerful for bad in a plant. I have seen this happen so many times and from listening to questions downstairs it has impressed me that there is a certain danger in presenting, without complete information at the same time, the sort of exhibit that we have down there. Some-

body comes in and gets an idea that in and of itself a planning board or other instrument for control is valuable, then proceeds to stick it in somewhere where it does not work, then the whole thing for which that board stands is dead.

Back of the average planning board installation stands first the collection of a great deal of information—information in respect to organization, materials, labor situations, equipment conditions, etc. If these instruments are designed before that information is collected accurately, you are headed toward trouble. Also—and I know I am running into the danger here of starting a great deal of discussion, some rather active discussion, but that is a good thing I think—there is one other thing and that is after that information is collected I still feel, and I think Mr. Berndt and the other men here who have had a lot of experience in installing equipment will agree with me, that there is still a grave danger in installing equipment of that sort unless other necessary things have been done.

For instance until materials, we will say—let's take one illustration—have been tied up in a plant, taken off the floor, stored properly and until provision is made for the proper delivery of those materials to work places and for the proper accounting materials so when you have records with respect to them you know they are right, any kind of planning, pre-planning, is very difficult, indeed, and no board is going to correct that situation. No other instrument is going to correct it.

I want to be frank, and I want you to come back just as frankly. One reason for bringing this up is that it seems to me that if the industrial engineer and the men on the inside of the plant could get together more on that kind of frank talk, both of us would have an easier time of it. The engineer on the outside is continually being pushed to do things in advance of the proper time for doing them and one of these things is this matter of control boards. It often takes a great deal of courage not to agree to make an installation of that kind.

I think this meeting is too big a gathering to take a thing like that up intensively, but I think we do get a lot out of a frank discussion as to the unwisdom—if I may be permitted to use that word—of premature installations of that kind and the responsibility that the engineer has for holding back.

Another point in connection with the possibilities of use of such instruments of control that is on my mind is this: No system however carefully it is planned—and all of us I think can bear testimony to this from our own experience inside and outside of the plants—can operate automatically, and the system is no stronger than the weakest link in the system. That means that you can have a well coordinated, well designed set of forms and

all the graphic instruments in the world, but unless Jim Jones out in the plant has been trained to make out records, requisitions and stores issues properly, your materials control, for instance, is not worth a damn—not worth the paper it is written on and that again means long, conservative educational work, and the real message that I am trying to carry to you this afternoon is the amount of educational work of that kind that stands back of these things that we are talking about. That is not a spectacular thing to talk about; it isn't exactly a popular thing to talk about, but it has been borne in on me over and over again—the necessity of talking about that aspect of work, and I have had it illustrated time after time in this exhibit downstairs in the last two or three days.

Now I think, and the Chair without question will agree with me, that the less the three of us up here talk and the more you people down there talk, the more successful this meeting will be. If we could stay in here and have a heart to heart session for the next hour and ask and answer questions, I think we would get much further toward accomplishing some of our mutual problems than we would by my reading a paper at you. (Applause)

THE CHAIRMAN: I am sure we all regret that the other leader and speaker announced, Mr. Frank W. Sutton, was not able to be with us, so we will continue with what I consider the most important part of the program, the discussion among the members.

I would like to say this: That I heartily endorse every word Mr. Simons said about two things in particular, first, the tendency to consider graphics a nice stunt, something spectacular rather than a real useful tool. On the other hand I think there is a tendency to think that after you have gotten the real results from a lot of production work and development work, that then graphics are the refinement. I do not want that impression to be left because Mr. Simons spoke about the possibility of getting graphics too early.

The other thing is that tendency to get into them too early before all of the foundation work has been done. I have a little story to tell about the stunt thing that I think might be amusing. In a particular installation there was a hard foreman to deal with and it was rather difficult to get him to quite understand or agree with the possibilities of graphics. It was not until we made a stunt out of it for him that we were able to have him use it. We developed the whole thing and then finally got him in and said, "Here, we know you don't think this is worth a darn and probably it isn't; maybe after a while you will convince us that it isn't but, incidentally, we want to have you see what it says". He looked at it and didn't believe it. He checked it up and found that some of the things were true and finally

all of a sudden the thing appealed to him that there was something wrong and he went up to the board and did not stop to find out the reasons back of the whole board, but he put his hand up to a certain operation and I think he had it in for that particular workman. He was one of the fellows who always got his results by driving. He picked out this operation, went up to the Board, put his hand there the distance that the man was behind, went to the operator and said, "You are that far behind in the work and By God we have to get it up tonight". (Laughter) That was the stunt appeal we had to make to him.

I am going to suggest that each speaker talk for three minutes and then if everybody has had a chance, you can talk again.

MR. PAUL ARTHUR (L. V. Estes, Inc., Chicago): I feel sure that what I have to offer may not augment what you have already heard. I am sure you all agree with me that the subject has been covered in a very nice manner and that possibly the discussion which is to start now will continue along detail lines only.

Possibly it might be well at the inception to define graphics. We may look upon graphics as being of two kinds: The historical kind and the planning kind. The kind we see in magazines, and a large quantity of those we see in our exhibits below are, in my opinion, historical graphics. They have their value but the finest use of graphics is the planning use.

If we can plan and graphically show what we have planned, then we are using graphics in the best possible manner. I take it for granted that every one here will agree to that, because to me it looks obvious and it looks logical. But to merely portray graphically what we want done is not all there is to graphics. We must portray what we want done in relation to very many things. First, we must portray what we want done in relation to sales orders. Second, we must portray what we want done in relation to financial ability; third, in relation to the material on hand, both raw and finished, and we must portray what we want done in relationship to the productive capacity measure of the plant.

Gentlemen, you cannot carry out graphics and carry them out successfully unless you have a measure of your productive capacity.

Graphics have been chosen because there was a need for them. Memory control is an impossibility. There is no need trying to memorize the operations, let alone the consecutiveness of operations. Assume that you have a single machine, one hundred pieces, one thousand operations. Give me a master mind, a good chess player and I will tell you that man could possibly memorize every one of those operations on those one hundred pieces. That is fine and it is glorious, but we must so draft these opera-

tions that the processing will be in relationship to each succeeding operation on any respective piece.

Furthermore, we must so draft those operations that each processing operation will be in relationship to the delivery date.

Again, sight has been chosen and graphics are the only means of using it—of using sight. Sight is the most compelling of all the senses. Without sight we would be lost. The blind man reads by the sense of touch, but that is obviously impractical in graphics.

Another point in connection with graphics is that material must be tied in definitely on definite orders and in relationship to definite delivery dates. It is not an easy matter to do this unless your charts are so constructed that the relationship is immediate and automatic.

In my opinion—I hope to start something here—the best type of graphics are those based upon first, a schedule and flow chart. A schedule predetermined by the management, to be defined by the production department and to be executed by the operating department. On this schedule and flow chart in relation to delivery dates we will draft our material allotments—we will choose the methods that Mr. Knoepfel has so ably described in his paper here today. We will also record on this schedule and flow chart our attainment in relation to delivery dates, let us call them zero hours of processing, zero hours of finishing and zero hours of starting of operation.

We will, therefore, have tied in on one chart the material, schedule, desire and attainment.

In connection with this schedule and flow chart I will venture to say that we should have what I would call a machine load board. On this board we should load the operations clearly and definitely in relation to the schedule set forth on the schedule and flow chart. The relationship must be there and it must be clear.

THE CHAIRMAN: I am sure we appreciated Mr. Arthur's contribution. Now can we not have some more discussion, questions or opinions, anything that will contribute to this subject? We are all here to get something from this meeting. Can we not hear from some of the men who are in the plants either handling this kind of work or dealing with these problems each day? I know that in my own experience where I get the most interest and the most inspiration is from those men.

MR. WAGNER (Chain Belt Company, Milwaukee): I want to ask a question in regard to planning and control boards on the part of contract work for conveying elevator machinery. What would be the basis?

THE CHAIRMAN: That could be answered from the platform but we would like to have an answer from the floor first.

MR. ARTHUR: I would say, Mr. Wagner, that the contract work can be covered by graphics. I further believe from practical experience of jobbing and contract work that graphics will control such work in very fine shape. The base of this, if I understand you correctly, is to load only a few days ahead of time, not to load too far ahead because subsequent orders received may utterly nullify your schedule. By taking, let us say, an average period of time ahead, two days or three days, you can control production and keep your plant running practically one hundred per cent hours efficiency at all times. If you try to load too far ahead, you may have to substitute other orders in the lines and cause trouble.

The danger of loading too far ahead on the contract in a job shop is commonly overlooked and you sometimes go too far in that direction.

MR. CALDWELL (Cutler-Hammer Co., Milwaukee): I was going to ask in connection with not planning so far ahead on contract orders, how closely possible it is to figure out what your delivery date is or your date of completion; that is, if you do not lay that order out to its ultimate finish, how nearly can you approximate when it will be done?

MR. ARTHUR: By setting out a daily schedule which is not graphic. You have an analysis made of the total number of productive hours required. If that order is started on its run you can see from your daily summary of productive hours allotted against orders how many days ahead the shipping date will find itself.

If, however, you have to change your run of orders, that will naturally again find its expression on your daily summary of hours against production. It is unwise to load too far ahead for that reason—you will undoubtedly meet complications. On the other hand, if the order as scheduled does run itself out as originally planned, your first delivery promise is correct. You will have to modify it if you change your runs; you have to modify it anyway whether you use graphics or not. You are anxious to hear about the means used for controlling a delivery promise if you had to break up a schedule. That is the answer and that is what I have used and in furtherance of your question I might say that in one particular plant I have a telephone connection with my control boards and receive an R. O. A. notice from the shops as to the status of the work. In this particular plant they load three days ahead and we are able to make changes but we change only beyond the three day period. If you came in with a rush order and said, "I have to have that right away", I would tell you, "All right, we will put that in day after tomorrow". I would inflict a little penalty on you because I blame you for being careless and not planning your own work a little better.

That will not answer in all cases because sometimes work has to be

done regardless, but where possible we hold to that definite three-day schedule. If you came to me and said, "I want to have something in right away", I would say, "Day after tomorrow".

MR. E. B. GRAUPNER (L. V. Estes, Inc., Chicago): There is another solution to that same problem. Ordinarily in several installations I have made I have always found it is good practice to take a certain percentage of the potential capacity of a department, set that aside for repair orders or rush orders or other conditions that you would have. That can be taken care of very nicely by a certain percentage of time that is ordinarily taken up with these rush orders and map orders, etc.

THE CHAIRMAN: Does that answer your question?

MR. WAGNER: It clarifies the question. We have not installed the planning board but I was thinking of installing one.

THE CHAIRMAN: I would like to make a suggestion regarding questions. We are here to get the greatest amount of good information for the greatest number and if you please, try to make your questions fit a principle rather than an industry because I am afraid some of the people here might not be interested so much in the industry as in the principle. If you can do that, please do, if not, we will welcome any other discussion. I think that particular phase can very well be considered under the entire principle of whether we can control and plan those operations which are difficult to standardize and which are far from the point of control.

MR. PETERS (Chain Belt Company, Milwaukee): In connection with the remarks made by Mr. Simons about putting in charts and graphics too soon, it seems to me that the industrial engineers are partially responsible for that themselves. Nearly all of the writings on the subject, all of the magazine articles, emphasize the use of the tools rather than the principle. I remember myself that in some of the old books written by Taylor and Gantt, the underlying principles were emphasized a good deal more than we see them today. Nowadays nearly every magazine gives a lot of charts, curves, dials and one thing and another in them and it is no wonder that the tendency is to apply those things when plants are not ready for them.

THE CHAIRMAN: That is a very, very good point and one well taken. I want to throw just one little sidelight on that, however, not to pass the buck at all, but I am going to suggest to you that the magazines, the technical journals themselves, are a good deal to blame for that, for this reason: They will not accept what they call high-brow technical stuff. They want the stuff with a lot of charts and pictures, the thing that is going to appeal, they think, to the magazine readers. I think you are perfectly right in stating that the magazines, the technical journals of to-

day, do carry on too much of that spectacular side and I think that was the thing Mr. Simons was hitting at, but I know from experience that a number of the magazines have come out and said, "Well, we can't use it, it is too full of the academic principles and philosophy and we have to have a lot of charts and pictures. I think that is something well worth considering and discussing further. Have you anything to say on that, Mr. Simons?"

MR. SIMONS: One thought came to me and that is this: I think we have to admit what Mr. Peters says is true. There is another reason for it, too, and that is that this is a young game. Those early writers brought out the principles well. Mr. Emerson has brought them out well, but there has been a big expansion of the whole field and the development of methods has been an absolutely necessary step. I think that, combined with the fact that Mr. Berndt brings out, is probably the reason for this swing of methods and stunts that you speak of. It is a dangerous swing.

Mr. Berndt suggested that one of the remarks I made was open to misinterpretation. Mr. Arthur made a useful distinction in that connection when he distinguished between historical graphics and the planning graphics. Early in any installation in order to get facts in relation to other facts, you are forced to use historical graphics. What I really meant was that the planning graphics, particularly, can be used too early in the game before there is enough of that information collected and before the individuals in the plants are trained to their intelligent use.

MR. ARTHUR: I want to second Mr. Simon's thought, that planning graphics are the desideratum of graphics. It is an easy matter to have graphics; it is a very, very hard matter to have the right kind of graphics. To me, the right kind are the planning kind. I believe that graphics are installed too early quite often and I would agree with you, Mr. Berndt, in saying it is due to the fact that the magazines show graphics which are always or very nearly always historical graphics and the man that tries to apply them, unless he thoroughly understands what he is going to do, is going to make a failure of graphics and lay it at the door of the industrial engineering fraternity.

I might give a word of warning here: Don't apply graphics unless you understand them thoroughly. There is no magazine that has ever been published yet and no articles published that tell you clearly and definitely how to apply graphics in your own particular plant. As industrial engineers, we know that each problem has to have its own separate and distinct analysis and the things you find in magazines are things of history. The things that are applied today by the up-to-date industrial or-

ganizations are things that do not find themselves in print for a long time yet. For that reason I would say, do not obey your impulse when you read magazines because those graphics are historical graphics and not planning graphics and they are surely bound to get you into trouble.

THE CHAIRMAN: I know that we would all be glad to hear from Mr. Sawin. We want to hear more about the individual plant.

MR. SAWIN: Aren't we ourselves to blame? We read Mr. Taylor's two books, then Gantt's books, then Emerson's books and then a little later Knoeppel's "Installing Efficiency Methods", and then aren't we prone to think we have all we need and rush into the charts ourselves? I think we personally are somewhat to blame and probably it would be well for each one of us to go back and review the old land marks and see whether we really are as far ahead as we think we are.

MR. ARTHUR: I believe that graphics are the one desirable method and means of obtaining scientific production control. I believe that our society, a society of industrial engineers, should put itself on record in opposition to the installation of any graphics unless those graphics are based on a thorough understanding of the planning feature of graphics.

MR. FRANK I. BARRUS (Russel-Burdsal & Ward Bolt and Nut Company, Rock Falls, Ill.); We have at different times used the planning graphics and I think we have accomplished the graphics along the lines of historical graphics such as are mentioned. We have taken practically everything of interest in our factory and have put it on a graphic basis, incorporating it in one grand book for the use of our General Manager. We represent the Western plant of a large bolt and nut factory and it is necessary at different times for our Manager to go East and he considers his book of graphics invaluable. When he leaves the factory for his eastern visits you will always see under his arm his book of graphics.

I mentioned the fact to different acquaintances of mine that we had in the neighborhood of close to 150 of these graphics and they would immediately say, "Well, now, that is altogether too many. We have cut ours down to two".

When you take into consideration that it takes possibly a half hour or a half day. I should say, of work each month to keep these graphics up to date and at the end of the year, or possibly a little longer, to carry your averages, you can readily see the historical effect that you have and the wonderful amount of information that you have accumulated for reference value.

We carry daily the relationship between the orders, the shipments and the manufacture, all on one graph and it is a wonderful thing to watch the fluctuation and then the averages, working it from the basis of totaling

the production, totaling the orders, totaling the shipments and dividing by the number of working days in the month. Finally towards the end of the month you find a pretty even line and we find that these graphics are things we are all well proud of and anxious to keep up.

MR. HENRY J. JUNG (Hardwood Products Co., Neenah, Wis.): I take it from the paper submitted and also from the discussions that theoretically there should be no department of operation that could not in some way, shape or manner, be controlled by the Planning Department and in view of that fact I would like to bring up a technical point in connection with the industry with which I am connected, the lumber industry—cutting up of lumber into various commodities through the Cutting Department. We have found that it is impractical to send an order by the Planning Department to the Cutting Department to get out a particular order at a certain time: In other words, we have found that it is best to take any number of orders that happen to be on file at the time unfinished and cut out of that board the best kind of a piece to apply to an order that you could get out of a particular board. It would not pay to cut an order full and start the next one, because the percentage of waste would run to such an enormous amount that it would be out of the question and you would lose money.

I wonder if there has been any solution of putting a proper planning and dispatching system in a Cutting Department of that kind, that is, where you are jumping from one department to another? The Planning Department has no control over the production of that department whatsoever.

THE CHAIRMAN: That is a good question. Has any one else in the audience had that similar problem? We have and I know it is one of the difficult problems. I do not know of an industry it does not come up in.

MR. WM. J. BURGER (Warner-Swasey Company, Cleveland, O.): It seems to me that the planning board is out of place in some factories and I believe it would be in our factory. I think some factories are too small to operate a planning board at a financial gain. The Tabor Manufacturing Company has often been mentioned. About a year ago I had the privilege of visiting that Company and investigating their production control of the planning board. A number of the gentlemen who were with me felt that a good live shop superintendent could earn a whole lot more for that organization than their production control plan and planning board put together, and I would like to know if there is any one else here who has any opinions in that respect.

THE CHAIRMAN: Before we go on with that discussion I want

the answer to Mr. Jung's question. What about the question of planning such operations as cutting up lumber where you are doing it for a lot of different orders? I am sure others in the audience have had that type of problem. Are any of you in the structural steel business? What have you done about detail?

MR. JUNG: I am interested in cutting lumber, strips for instance twelve inches wide and some four inches wide, etc. Certain orders go through the mill bearing nothing but four inch stuff and others two and three inch stuff. The Planning Department cannot intelligently control the Cutting Department as far as we are concerned; that is, it could not start this order now, cut it out of that lumber and finish up the order because it would be too much of a loss. I wonder if anybody so far has found a solution to such a problem.

MR. WOY (Madison, Wis.): A problem somewhat similar to that might be answered by a historical graph of the past requirements of the usual shop flow so that you can from that anticipate to a limited extent the average requirements which may be expected in the early future. Then taking particularly your rush orders, push those things through, having those primarily in mind in cutting your stock. Where you have no standing order but certain particular cuts which will provide a stock requirement, let those fill in. In other words, let the planning bureau that issues the orders on specific orders, that is shop orders on specific customers' orders, also be able from their close acquaintance with the plant flow to issue certain floating orders, you might term them, or certain stock orders which will absorb this overflow of the standard cuts or this overflow of these specific cuts which are being required from the certain sized lumber that is coming into the shop, and let those stock orders consume as far as they can the wastage which is to be expected in cutting this specific order.

In other words, it is the planning bureau's function to economize those particular things. That can only be accomplished by close cooperation and intimate acquaintance with the planning bureau. I have seen it operated in an entirely separate and distinct industry, the conditions of which are too elaborate to take up. That might be one solution of the question asked although I don't know so much about the lumber business as I might.

MR. JUNG: We are carrying out that idea. We are issuing stock orders for such and such a commodity of which our orders are mostly composed and getting what we can on the orders as they come through. In arriving at your costs which you want by order, you have to take your average cost in the stock and apply it. You do not get exact cost. That is our plan and I wondered if anybody had a better solution.

THE CHAIRMAN: Is there any more discussion on that point.

Now the speaker that I was forced to hold up—I am sorry—made a direct challenge, suggesting that there were places where the planning board would not work, and he even dared to bring forward that pet plant, the Tabor Manufacturing Company, as a place where a planning board could be substituted by a live superintendent. He asked if any one else here had the same feeling. In the first place, I am going to ask you to raise your hands, any of you that do have the same feeling.

(Four hands were raised)

All right, that is the kind of discussion we want to get. I am going to ask the balance of you to defend it. As far as numbers are concerned it ought to be perfectly easy. Come on now, I am just itching to answer that question and it is the hardest thing in the world for me to hold myself back.

MR. BURGER: How many here have visited the Tabor Manufacturing Company?

(No hands were raised)

MR. H. A. BULLIS (Minneapolis): I am not going to speak so much on the planning board but on graphic matters in general as I think they apply to this question.

The benefit we have derived from graphic methods— and we have a graphic department which we hope in a few months to be second to none in the country—is great. We do not handle only the manufacturing end in that department, but also the sales and financial figures. We have found in our own case, take the case of the accounting figures to be put out to our various mills, previous to the time we began to put these figures out in graphic forms, in simple squares, charting every foreman's record in comparison with every other foreman's record doing the same class of work, we did not pay so much attention to cost figures. We take all of our loading floors, say we have eight loading floors, and we take each foreman's record and compare it with every other foreman's record for that work, and with his accumulative record for any given time we put those graphic charts before the foreman where he can use them on his own floor.

We found that the production and the efficiency of these foremen jumped up a great deal.

Now bringing up the case of a good live superintendent, here is a man who is trying to speed up men through his own efforts. I believe by graphics, by the boards which have been mentioned here, the foreman or the worker himself can see and can visualize his own record as compared with other records and there is a spirit of rivalry among the foremen,

among the workers that no live superintendent possibly can generate.

In connection with our problem I might mention that this discussion has been almost all on planning boards. I would say that is a big feature of graphic charts but it is only one of the features. In our graphic department we make an attempt to analyze all problems which come up by graphic means. We first attempt to have the problem stated, that is put down on a chart, upon a blackboard. Then this problem is separated into its various sub-problems. These sub-problems are separated into their various factors by means of graphic charts and blackboards. These factors are given their weights and at the bottom of the big chart the solution is attempted to be shown as to this problem.

Another way in which we use graphic charts is to visualize the financial statements, particularly the profit and loss statements, especially so when these go down to the foremen and superintendents.

Assume that we have various mills in which we want to let the superintendents and foremen know exactly how those mills stand. When we take up the ordinary profit and loss statement, the worker in the plant, the superintendent and even the big chief rarely, if ever, know the technicalities of financial statements, but if you can show them by means of a graphic chart just the items in their relative comparison in this statement, it is going to bring home the facts of the case to them.

Take a profit and loss statement and we will put up at the top of our chart a square. Call that the total sales with the amount called one hundred per cent. The total sales will be split into two other sub-squares, operating cost with the amount which may be, we will say, 95% total sales, and the other square will be gross profits with the amount and the certain rate of the total sales. Now the operating costs can be sub-rated by simple graphic charts giving three elements in the manufacturing costs—material, labor and overhead, with their rate of the operating cost.

Each of these can be further sub-divided into whatever the thing is, labor, direct labor, indirect labor, etc., and overhead in the various items. Gross profits can be sub-rated into administrative costs, general costs, net profits or whatever profit and loss might be.

We have had it happen that officers, superintendents, etc., have been seeing profits and loss statements in various sections in which they were connected for many, many years, but as soon as this was put in graphic form and shown to them they came across with the comment that they had been seeing this statement for thirty years and did not know how it was gotten up. The graphic picture showed them what they were doing, what percentage of their supervision was total operating cost sale and whether it was high in comparison with some other mill or floor.

Here again the spirit of rivalry was created and they endeavored to cut down on operating cost.

A man who uses graphics in the right way must be not only an engineer but a thorough statistician in the true sense. He must combine not only engineering training, mechanical drawing and a good share of mathematics, but also he must be a thorough statistician, because as we get into the technical side of charting, indexes and various other things such as Pulley, Secrist, Wilford I. King, Rule, Irving Fisher and a great many others are putting out, that is a coming thing in the business world, not only in the manufacturing but in the distribution and in financial accounting, and the man who makes the graphics of the future must be an engineer and a statistician, too.

THE CHAIRMAN: The last speaker said that we had talked a great deal about planning boards. That was the subject of the meeting, planning boards and charts, but that referred to planning. If we got into the question of statistical presentation, we would never get through it.

I saw in the last speaker's remarks an elegant answer to that challenge, and that is that it is a sad mistake to think for one minute that planning boards of any kind can never be considered as substitutes for supervision or as substitutes for superintendents. They do not replace each other. The real live superintendent of today is the one who will use the planning board as a service for himself.

I think we want to get some more discussion on that. That is a very interesting point. I think that there is too much of the idea that planning is one solution in itself and supervision is another. What is the whole function of planning? Let us get some more discussion on it.

MR. PETERS (Milwaukee): We found one thing to be the case in our plant since we started to plan the work—possibly I am biased in this, but it seemed that everybody was dumping everything on us. In other words, the superintendents and foremen apparently washed their hands of a lot of this work that they had been doing and figured, "Well, these fellows are going to take care of it very fine". I want to say right here that no planning department that was ever designed or built will run on those principles. It has got to have the full cooperation of the shop, of course, and the shop and the planning department both have to fully understand their functions and how they fit together.

The fact that there is a planning department or a production department does not mean that the shop can forget all about orders and only look at processes. The production department cannot swing the whole thing themselves, and that is one thing that I think is very often forgotten when this sort of an organization is presented.

MR. J. J. DAVIS (Paine Lumber Company, Oshkosh, Wis.): The reason my hand was in the minority in this matter was because I have in mind two or three departments in our business which in themselves are more or less graphic in their nature. A sawmill, for instance, a graphic planning board in a sawmill is nonsense. Graphics representing results, graphics indicating production, costs of a sawmill, etc., of course are very good and are used by us, but a graphic planning board in a sawmill, or any such department is nothing but a plaything and would accomplish no useful purpose.

I have in mind another department in our business which takes care of material which is, to a certain extent, waste and over which nobody can attempt to have any definite control. In other words, the amounts of materials that are to be taken care of by that department are known only very shortly in advance of striking that department. The place was disorganized, the machinery was placed without logical arrangement and we attempted to get control of it with a graphic planning chart.

Operation of that chart for a short time indicated to us that a rearrangement of the machinery in the department so that the processes were in logical sequence was what was necessary. When we had the processes arranged in that sequence we no longer needed any planning chart or planning board because the foreman by taking one look at his department knew exactly the condition of the flow of materials better and first hand and quicker than he would get it by any board. I believe that in those instances at least, you cannot stand up against the minority.

There is one procedure that we have adopted in our plant that I wanted to throw into this discussion provided you are willing to admit that we have some justice in our position, and that is the procedure that we have adopted in getting other departments to take hold of planning boards. We have taken the position that the character of the board was of no particular importance. We have allowed the foremen and clerks to adopt pretty nearly any method of graphics which they may choose. If they wanted to hang tickets upon pieces, we let them hang. If they wanted to use a lead pencil on a piece of chart paper, we let them use the lead pencil. If they wanted to take a blackboard and draw lines and squares on it, we let them use the blackboard. We let them use any sort of mechanical device which to them seemed best suited for the purpose, and if it did not involve much expense we let them throw it away afterwards and get something that was better; working on the opinion that the most perfect device from a scientific standpoint that was conceived in the mind of somebody else would not be as useful to the end that we wanted to reach as a less

perfect device that was conceived in the mind of the fellow that was to operate it.

I would like to have that policy criticized one way or the other. Another thing that I have discovered in trying to get different individuals to take hold of this scheme of graphic control in several different departments has been what to my mind seems about like trying to show somebody else the man in the moon. I have used that illustration more than once. It seems to me that the problem of getting an individual, a clerk or a foreman to get some use out of a planning board is almost like getting somebody to see the man in the moon. They cannot see a thing when they look at it. There is nothing there until suddenly they get the idea and when they have got it they cannot look at the moon without seeing the man. When they have got the idea of this planning board, they cannot look at the planning board without seeing its purpose and using it. Now is there anything wrong in our method or is that the usual experience? (Applause)

THE CHAIRMAN: Well, I was very much surprised when I saw Mr. Davis' hand go up. I knew something about his work, and he has admitted that he was not among the minority at all. They have all sorts of planning boards over there. Mr. Davis brought out a matter that needs clearing up definitely and that is that there are types of industries in which you do not want planning boards. Incidentally, the planning board and the type of planning board and factor for control are different in different industries. There are any number of industries in which the only planning you can do is the planning of maintenance. As far as the mechanisms are concerned, we have a common slogan in our organization when we talk about the control board that the board is a filing system, nothing but a filing system, a place to stick some things. The question of the use of the board and the use of the information is what counts. I think Mr. Davis' point is well taken that the mechanism which will get the result is the important thing rather than the type.

There is one thing about types of boards, that is important. There has been a certain amount of experience in designing boards and charts which is valuable.

About ten years ago I had one of those experiences that might be interesting. One of the first boards that I ever worked on was a board with a lot of strings along the wall. I had little tabs of paper on which there was one of these little hook clips. We hung the pieces of paper on these wires and strings along the wall. That was the first planning board I worked upon. The son-of-a-gun who used to come into that office, give

the strings a kick and throw off all of those hooks was the fellow I had it in for, and that happened pretty regularly.

Of course there have been steps of progress in the presentation which is almost a study in itself. There are hundreds of different types of boards. After all that is not the important thing except when you get into big installations. Take a big plant where there are hundreds of thousands of operations and where the detailed work of getting your controls together is important. There it is certainly economical instead of doing it a way that will take one hundred clerks, to do it a way which will take fifteen if that is possible. That is the place for your refinements in the work.

In our own practice, I dare say, we have twenty-five different types of boards; the other day I was in Buffalo and one of our men said, "I have a brand new type of board that is going to kick everything else off the map".

There is one thing I cannot let go by without further discussion on that charge of a superintendent substituting for planning and that is the planning board as a service to the superintendent. Here is a very important feature I have found that may be interesting. The more complicated your industry, the more variable factors, the more results from planning.

There is a very simple and brief rule. In your sawmill or planning mill where your operations are few, where you haven't the multiplicity of factors, your control is not worthwhile, but as you multiply your operations by hundreds, your design, your materials, your possible combination of those factors—I know a plant where there are at least thirty thousand operations—and I defy any superintendent in the world to be able to take the place of a planning and control board there. He should not be expected to do it. The blackboard and the control is an aid to him. In some of the big plants that we all know of, it would be utterly impossible for a man to attempt to cover them without such aid. There are smaller plants where it is more possible and I think the question of the value of the board depends on that question of complexity; whether the variable factors are many and multiplied, down to the simple ones.

The last point I am going to ask Mr. Simons to talk on and that is the question of Mr. Davis' man in the moon.

MR. WILSON (Kearney & Trecker Company, West Allis, Wis.): I do not know whether this man comes from the Warner-Swasey Company or not, but he mentioned something of Warner-Swasey and if he does, I want to extend him an invitation to come to the Kearney & Trecker Company and we will endeavor to show him a planning outfit that is working in the machine tool industry. I will say that our works manager has, in

the planning department, reduced production cost twenty-five per cent without reducing any of our men's wages.

THE CHAIRMAN: I am going to make the last speaker the general of our army of opposition. That was one of the finest strokes, it seems to me, as a proof to the three—Mr. Davis is out of it now, we have him all won over—but there are three others and I think before we get through we want to make sure they go out to the Kearney & Trecker Company because that will be the best proof in the world.

MR. BURGER: I have been there several times and I agree with what the gentleman says, but that does not change my opinion in a plant of our kind because it is no comparison. They make one machine and a few sizes. Their problems are more simple. That does not alter my opinion on the Tabor Manufacturing Company.

THE CHAIRMAN: Why doesn't some one say that the complexity of that proposition is the thing that needs the control more. That is the answer to it. The fact that it is complex makes the Warner-Swasey proposition so much more a problem for planning.

MR. SIMONS: I think there is possibly a little misunderstanding. I did not understand from the original question, whether a control board as a control board was needed. One of the gentlemen has a very good planning system in their own plant but they are not using a control board.

Mr. Davis has raised two points that I am glad to have a chance to come back on because I think they are very, very fundamental to our work, and Mr. Peters of the Chain Belt Company touched on one of them when he mentioned cooperation in the department.

What Mr. Davis was really getting at, fundamentally, was the necessity for making the man on the job feel that he was really having a chance for self-expression and a chance to do his work his own way rather than some one's else arbitrary way. Am I fair in that, Mr. Davis?

He raised another point also, that I wanted to answer which I did not quite have the courage to answer at the beginning. That is the question of complexity of some of these things people cannot understand. I would like to ask any of you who are presenting an exhibit at our next convention of the S. I. E. if we could not get together and agree not to put any exhibit in that convention, any chart that could not be explained in a very simple way so that people can go through there and understand what the charts are.

Mr. Davis has brought up the real thing, I think in the difficulty of the workmen understanding certain parts of the work and the importance of their understanding. I stood downstairs there and watched men come through in the accounting side of our organization. They go through a

whole exhibit in twenty minutes down there. I think we are doing something that is dangerous to put up a lot of charts that seem complicated without explanation. There is a mystery that should not exist.

Mr. Peters raised the question of the necessity for plant cooperation and Mr. Davis brought up the question of getting the man to feel that what was being done was his. I want to go on record here as saying that it is my firm conviction that unless installation work is handled on the basis that Mr. Davis has presented, it cannot live. In other words, nothing in a plant is going to live no matter how good it is in itself unless the men using it are convinced that it is right and they cannot be convinced that it is right unless they understand it.

If there are two methods, one of which is theoretically best and the other good and workable but not so good as the other one, and the man who advanced that second method which is not so good understands it thoroughly, it is usually a better idea to practice that method until you can educate him up to the point of view of the better plan. Also—this is a young man's game and most young men I think we all agree are egotists, constructive egotists, often, but egotists. We feel so strongly the correctness of the thing we are doing that we want to force the thing across whether the other fellow wants it or not and I think that unless we can sell our work through the man rather than over his head, we cannot go very far toward real lasting work. In other words, the successful installer has got to be willing to make suggestions in a round-about way, very very often. Let the other fellow take the credit for it and clap him on the back as he does it. That means not only the industrial engineer working on the outside, but particularly the man in charge of the planning department or the industrial engineering department in a plant. He can accomplish in the long run a great deal more that way than he can by pressing his own particular ideas across. It is a real problem that any man who has lived through an installation knows all about. (Applause)

THE CHAIRMAN: Have we properly squelched this minority? I would like to hear some more discussion on that question that Mr. Simons brought up about the difference between planning and control. I think that is a very real question. I know that control is often confused with planning and vice versa. You hear a lot about dispatching and scheduling mixed up. I wish we had time to go into that and get a real definition. Mr. Simons, won't you say something on that?

MR. SIMONS: You and I agreed that the others should do this talking. I think if some of these men would discuss that it would be much more to the point. What I was really trying to distinguish between was planning and some particular planning device rather than between plan-

ning and control. That thought was suggested by the fact that the Tabor Manufacturing Company has a very good control system although I do not think they have a planning board. They are doing most of their planning on route sheets rather than through a board. I thought we were making a minority out of them because they were not distinguishing through a planning device rather than control through some sort of planning.

MR. DAVIS: Let us have a definition of those four terms.

THE CHAIRMAN: Will some one in the audience make a contribution on that? I would like to have it defined.

MR. BURGER: I would like to say that I believe in charts, I believe in plotting performances of different departments in the whole factory and in the efficiency of the departments. I believe in machine load charts, but I cannot see the sense of some of these large and elaborate planning boards that operate all right while some particular person happens to be there but if for some reason he goes off to a picnic or is sick, the next day it is pretty well mixed up.

THE CHAIRMAN: They need organization as well as a planning board. I suppose this is a discussion that we could keep at for hours. I know that I would like to. The whole question of the definition of the four terms is very interesting in itself.

MR. SIMONS: I think that the men might be interested in knowing that the Society has a Committee at work that has charge of all nomenclature, and might be asked to contribute.

THE CHAIRMAN: That work is up to an organization in New York on nomenclature, composed of representatives of the S. I. E., the Taylor Society, the A. S. M. E., the National Association of Cost Accountants and the American Institute of Accountants and the American Industrial Relations Association. The six organizations are getting together. The first job is the selection of the list of names. I assure you those four terms are part of the things that are going to be discussed for a finer definition.

MR. SIMONS: I do not know that I have a right to say this because I am a member of the Chicago Chapter rather than the Milwaukee Chapter of the S. I. E., but I think you might be interested, some of you who are not members of the organization, to know that the Milwaukee Chapter, as well as the others, is discussing problems like these every time they hold their meetings and guests are always welcome. The most successful meetings are those where a lot of people come in from the outside with their own points of view and raise those questions, the sorts of questions you people are raising here this afternoon. Mr. Davis, do you care to say anything about that?

MR. DAVIS: Not living in Milwaukee, I am not able to attend as many meetings of the Milwaukee Chapter as I should like to, but I know that visitors are always welcome to the Milwaukee Chapter and I have no hesitation in saying that I rather believe everybody here will probably be put on the mailing list of the Milwaukee Chapter as a result of the registration and will get announcements. If they are not closed business meetings of the Society, I am sure that the Chapter will be glad to have anybody who is interested in further discussion along these lines attend the regular meetings of the Chapter.

The Vice-President in charge of promotion ought to say that those qualified to become members of the Chapter will be welcomed and we will be glad to have them. I think he has missed an opportunity.

THE CHAIRMAN: I am expecting that the Milwaukee Chapter is doing that. I would like to do that personally. I would like to get each one of them myself because I have promised to get a certain number of new members.

I know that you regret as much as I do that the time is late and we have to think of adjournment. These sorts of meetings are real stepping stones in the progress of our work.

I always like to think of the whole thing as Mr. Emerson put it years ago, that the principles were the things that counted; the mechanisms were things that we could develop, they were not the permanent things, they were standards only as long as they were acceptable. Regardless of the fact that we had a little fun about planning boards here, we know that the function of planning control is important and I got a great deal out of the meeting. If you all got as much out of it as I did, I know that you have been well repaid for coming.

ADJOURNMENT

DINNER MEETING OF PERSONNEL GROUP

At Hotel Wisconsin

Friday, April 29, 1921

Chairman: ALLEN B. CROW

Detroit

"THE OPERATION OF AN INDUSTRIAL SAVINGS PLAN DURING COMMERCIAL DEPRESSION."

John F. Tinsley, Vice Pres. & Gen. Mgr. Crompton & Knowles
Loom Works, Worcester, Mass.

Since the War, several plans for encouraging the industrial worker to save have been established. Whether or not these plans survive the present period of industrial depression will determine their value to a great extent.

One of these plans, known as the Worcester, Mass., Industrial Savings Plan, has so far weathered the industrial storm very successfully and this paper will give the results in the Crompton & Knowles Loom Works which inaugurated the system.

Without going into fine detail, the Worcester, Mass., Industrial Savings Plan is an out-growth of one of the Liberty Bond Savings Plans conducted during the War.

After thoroughly worked-up shop campaigns held at intervals of three to six months, the employees are given an opportunity of signing a card authorizing their employer to deduct weekly a definite amount from their wages for deposit in any one of several local savings banks, specified by them. Each bank then issues pass books to those individuals designating their bank and the employer deposits in the bank each week the amount stipulated by the employees.

The plan is flexible, in that an employee may increase or decrease his weekly deposit, may suspend deposits temporarily, or make withdrawals at any time without being obliged to go to the bank.

Since the inception of the plan in December, 1919, \$215,000.00 have been deposited by our employees in the five savings banks of the city. There have been three campaigns, resulting in 65 per cent of the force taking advantage of this opportunity to save.

Besides opening new accounts, it is significant that 387 of those who were already saving, voluntarily increased the amount of their weekly de-

posits, and many others have at various times deposited extra amounts. On the other hand, the number decreasing their amounts has been practically negligible.

One of the questions which naturally arises in connection with this plan is the attitude of the foreign-born toward it. Our experience has shown us that, while the foreign-born employees were a little slow about accepting the idea, after they thoroughly understood the system, they became more interested and enthusiastic than the American-born employee, with the result that out of twenty nationalities represented in the plant, the American-born stood thirteenth.

It is also interesting to note the change in the attitude of the banks in this matter. It was hard at first to arouse the interest of the banks, but after the experience of the past year, the banks feel that the plan is excellent in principle and most practical in results.

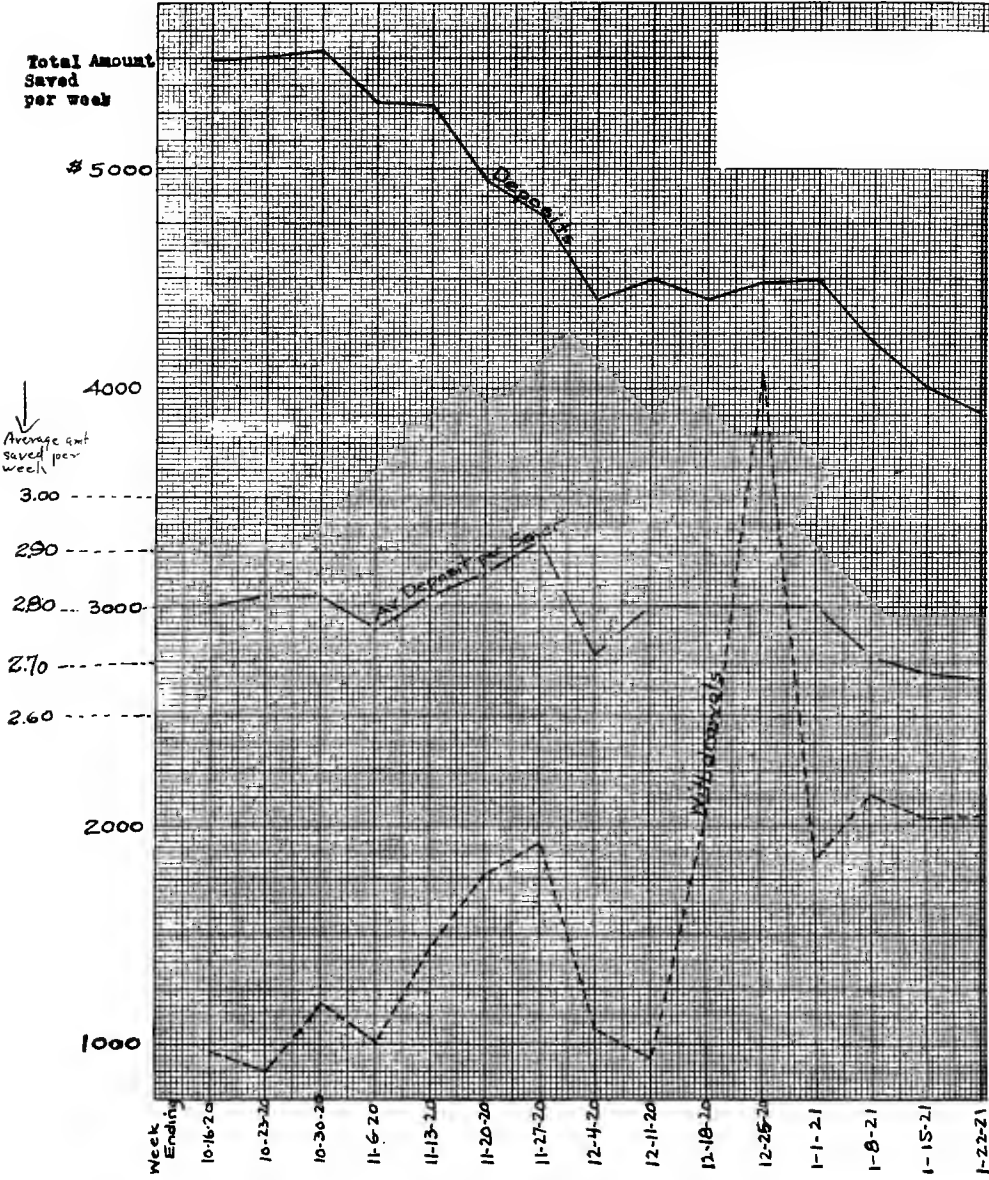
In order that such a plan may be successful, it is vitally important that the management strongly endorse it and make their attitude apparent to the men. Along this same line, the earnest support and cooperation of the foremen must be secured, that they may reflect enthusiasm and interest in explaining the system to others. This can be brought about by meetings, etc., at which the necessity of thrift can be emphasized, and stress laid upon the company's desire to aid its employees in this important matter. The writer believes that when these two fundamentals are established, the success of the plan is practically assured. The results of the operations in the plant with which he is connected would seem to fully justify this belief.

Probably the most interesting statistics are those which reflect the influence of commercial depression upon the Savings Plan, both as regards the actual savings of the employees and the attitude of the employees themselves toward the plan during this period. The following figures, which were compiled from October 16, 1920 to January 22, 1921, very clearly illustrate the exact status of the plan during three months of severe business curtailment. The accompanying curves are self-explanatory, but the following points are particularly note-worthy:

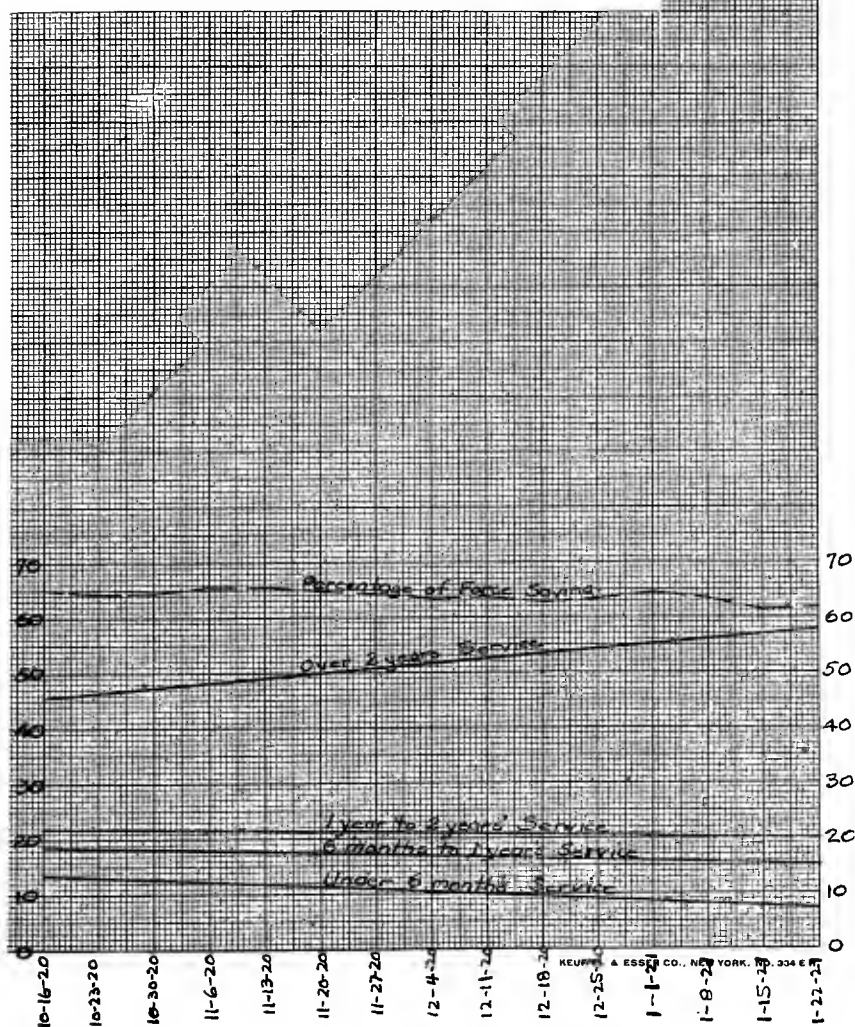
(a) **Relation of Withdrawals to Deposits.**

This is of vital importance in determining the true value of any savings plan. Along this line it is most interesting to note that at no time has the amount of withdrawals equalled the amount of deposits, and in most cases has not amounted to 50 per cent. Even during Christmas week the amount withdrawn was not equal to the amount deposited.

(b) **Comparison of Accounts of Men Laid Off with Those of Men Retained.**



Crompton & Knowles Loom Works
 Worcester, Mass.
 Study of Industrial Savings Plan
 Oct. 16, 1920—Jan. 22, 1921



We would naturally expect that the men laid off would not keep up their accounts and the figures prove this. The withdrawals of the men who left the company's employ, either through resignation or reduction of forces incident to business depression, showed that 88 per cent of their deposits had been withdrawn during this period, while only 35.5 per cent of the amount deposited by those still with the company was withdrawn. A study of those who left showed that 49 per cent had closed their accounts, 43 per cent had withdrawn a large amount of their savings, while 8 per cent had left their accounts intact.

(c) Relation of Length of Service to Savings.

Believing that it would be interesting to know the class of men who were saving, we made a study to determine what relation the length of service had to saving, and as we expected, we found that the "floaters" or those who, seemingly, did not work long at any job, did not save so well as the more desirable, or longer service, men. This is shown by the fact that, while in October 1920, 45.6 per cent of the savers were of two years' service or more, in January 1921 this percentage had increased to 58 per cent, while the savings among the six month men or less had dropped from 13.7 percent to 7 per cent.

(d) Percentage of Force Saving.

Another salient fact is that the percentage of the force saving did not vary during the three months more than 3 1-2 per cent either way from an average of 62 per cent, which proved to the workmen that the fact that they had money in the bank did not influence the management to take any unfair advantage of them by laying off these men. In fact, the management met this argument when the plan was originated, by stating that they considered an employee who could save and was saving more desirable than one who was not.

(e) Average Deposit per Saver.

The average deposit per saver has varied very little which shows that, although many of these men were working reduced hours, they did not give up saving or decrease the amount of their deposits during that period.

(f) Attitude of Employees.

From talking with employees who are taking advantage of this opportunity for saving, we find unanimous appreciation of the plan, many going so far as to say that they consider it the best thing the concern has done for the employees, although many other welfare and service activities are carried on by the company. Many employees stated that their only regret was that they had not specified larger amounts for weekly deposit during the good times, but that they considered themselves fortunate to have been able to take advantage of the plan at all.

(g) Necessity or Value of Thrift as Shown by Dull Period.

The attitude above related of the employees themselves furnishes the most satisfactory proof that some form of promoting thrift is of the utmost importance and value and that the best method to pursue in the furtherance of thrift among industrial workers is a plan whereby voluntary saving is systematized and made easy and simple for the employee. The value of such a system is demonstrated by the amounts that the employees of at least one manufacturing plant have saved.

After careful observation of the progress of the Plan during the past year, when both favorable and unsatisfactory business conditions have prevailed, we are convinced that it is thoroughly efficient and practical and, because of its simplicity, satisfactory alike to employer and employee.

FRIDAY EVENING CLOSING SESSION

April 29, 1921

Chairman: DWIGHT T. FARNHAM

St. Louis, Mo.

MR. IRVING A. BERNDT: As you know our President, Mr. Wallace, was suddenly called away and he asked me to take his place in introducing the chairman of the evening.

I will tell an old story about the Irishman telling a riddle. He asked what was the difference between a railroad spike, a railroad robber and a railroad conductor. The answer is a railroad spike grips steel, a railroad robber steals grips, and when asked about the conductor he said: "I only put that in to complicate it," and that is the only reason for me tonight, to complicate the meeting a little bit more.

Surely we need no introduction for Mr. Farham. Mr. Wallace said about one hundred and five per cent of the members know him anyway and just about every visitor knows of his work so you can spend a couple of minutes kidding him. I don't believe we have any minutes to spare and besides I found that he was very easily kidded, so I think we will pass on very quickly.

I should just like to say that probably there is no one more fitted to take the chair at this meeting, it being a very important one, than Mr. Farnham, particularly because he has studied the subject so thoroughly and can give some very interesting facts. For six months he has made a very thorough investigation of labor conditions in Europe and I hope we shall

hear something about that from Mr. Farnham tonight, so it is a real pleasure to introduce Mr. Dwight T. Farnham of St. Louis, Mo. (Applause.)

MR. DWIGHT T. FARNHAM: Ladies and gentlemen: While I was abroad I heard a story about an Englishman who was putting on airs. One day he met an American girl doing war work. He was describing the lavishness with which he traveled. He said he always had his valet and his Rolls-Royce and his traveling rugs and furthermore he said he never traveled without his bull. The American girl looked at him for a moment and said: "Hereford, Durham, Boston, or con?" I'll leave it to you to decide what kind of bull our friend who just spoke travels with. (Laughter)

I want to announce that very much to our regret Mr. Leitch will not be with us this evening, having been detained in New York. Dr. Garland of the National Cash Register Company has very kindly consented to show us some motion pictures of their plant and its many activities.

DR. D. F. GARLAND: The National Cash Register Company believes in introducing welfare work in industry in order to bring about better relations between labor and capital for two reasons. Mr. Patterson believes that it is only just that the owners of the company should provide what we call welfare facilities and services to the employees. Secondly, he believes that it is a good investment of money that the industry should invest some money in improving factory conditions and providing for health and well-being and contentment of the workers.

I do not propose to take up your time with the discussion of the subject. We are taught at the National Cash Register Company through the eye rather than through the ear. A few weeks ago a gentleman said to me—an educator from Scranton, Pa.—"Mr. Patterson is right. Seventy to eighty per cent of us are visually minded; i.e., seventy to eighty per cent get the major education through the eye and only twenty to thirty per cent are educated by the ear". So without any further preliminaries I shall ask the head of our lecture staff to give you the moving pictures and slides of the history of the National Cash Register. If we give you a bit of the factory history it is not to advertise our business but to give the reason for welfare work in industry and you will see that when you come to the last slide and it shows that it pays—it is a fundamental item in the industry. Mr. Hough will take charge of the story.

(Mr. Hough related the story of the history of the National Cash Register Company as the pictures were shown.)

THE CHAIRMAN: I am sure we have enjoyed these pictures very much. I regret that two of our principal speakers will be unable to be here tonight. I have already spoken about Mr. Leitch. A wire from Dr. Quinby states that he was suddenly taken ill and will not be able to come.

Mr. Berndt suggested that in as much as some people came here to get an idea of employees' representation it might be interesting if I said a very few words about the development of employees' representation abroad.

I do not intend to take any position one way or the other in regard to this matter. I merely wish to state a few facts. The point I want to bring out is that employees' representation is a thing that is not only before the country and discussed here but it is a thing that is before the world.

Possibly one of the most spectacular things was the development in Italy. Our party went as guests of the Italian Government and we asked many people about the labor situation while passing through the various cities late in July. The superintendent of one plant who was particularly well informed told me that he felt the labor troubles had just about reached their peak. At that time the walls of the cottages and buildings were plastered with signs reading "Vive le Lenin", and "Vive le Soveit".

We had hardly left the country before the workers seized the factories and fortified them with machine guns. Just before the crisis the factory owners decided to lock the men out. The mayor of Milan was in the chair at a meeting between representatives of the employees and of the employers. He sat there with a perfectly passive face while messenger after messenger came in with telegrams. He read them but said nothing. Finally the employers delivered their ultimatum that the employees should be locked out. When they got through the mayor rose and said: "There seems to be some misunderstanding. The employees cannot be locked out because they had already seized the factories." The result was consternation on the part of the employers.

But this experiment in Bolshevism was a failure. The factory workers had been told that the workers and the tools were the principal factors in industry. After trying to run the plants for about ten days they discovered that they could not get any raw material and that no one would buy their product. They also discovered that there was such a thing as management and technical control.

As a result, the workers climbed down as gracefully as possible and leaving it to the government to work out some means by which the working men could participate in management.

In England for a long time they have had the same movement under what is known as Whitley Councils. These were formed during the war. I made a particular point of finding out whether the movement represented industrial democracy as we know it in this country or whether it was more like our employee representation plan. I found that while the employees were represented that there was no question but what the management remained in command. I talked to many who were impartial and

they stated that some employees had brought up the question of participation in management, i.e., actually directing the managerial policy, but that that had been objected to by the employers. In some cases it had come to a show-down and it was decided that committee representation covered only the things in which the employees were **directly concerned**.

In some factories I found that they were making a great point of the educational aspect of committee activities. For instance, in one factory the employees did not understand why they couldn't be paid the last night of the pay week. The management brought the committee into the office and they saw the pay roll made up. After that there was no question about being paid the same night that the work week ended.

The Whitley plan has been put into effect in a number of factories and the council meets with the management. It is not in conflict in any way with the unions because most of the members of the employees' council are union men. In the English factories in some of the comparatively small plants as many as fifteen or sixteen unions may be represented. If all local matters were taken up with the various union headquarters it would take a long time to adjust controversies.

In France they are just beginning to take an interest in the employees' representation plan. In Germany they have a most comprehensive scheme worked out. Every factory of a certain size, must have an employees' council. The employees' council meets with a council made up of the management in the factory. Both sides elect representatives who in turn elect representatives until eventually it becomes a third house of parliament. This parliament has the right to originate all industrial legislation and the right to pass upon all matters which are brought up in the Reichstag which affect industry. That, of course, gives them the publicity privilege on all industrial legislation so that they are able to maintain a certain advantage in putting conditions before the people. So far the Reichstag has acquiesced in the constructive work which has been proposed by the third house of parliament which is made up of half employees and half employers with a small group of technical men and professors.

In connection with this representative plan has been organized the vertical trust. The vertical trust starts with the basic materials and goes right on up to the finished product. Most of our trusts in this country are horizontal, i.e., an American mouse trap king would make all the mouse traps in the country. In Germany under the vertical trust he would have a logging camp, a saw mill, a coal mine, an iron mine, a wire factory, and possibly some other plants, so that he would control his raw material all the way through.

The German organization of the trust under governmental auspices is

best understood if we imagine one multi-billionaire in this country buying up every industry in the country and organizing it into one monster trust. This monster trust in Germany is divided into twenty divisions and already the foreign sales departments are organized. This is most significant. Three trusts have been completely organized. One trust, which is partly organized for over a billion marks employs 375,000 men. I went through one plant belonging to another company which employs over 100,000 men.

In Italy a single company employs 100,000 men. In England one consolidation employs over 100,000 men and in France also there is a syndicate which has 100,000 men. So you see we have not a corner on big business concerns any more.

What has been happening in this country has been happening all over the world. With the advent of steam driven machinery industrial units have naturally grown. Any of you who have read Franklin's autobiography know it took him a week to travel from New York to Philadelphia. Nowadays you can leave for New York on the five o'clock train from Philadelphia, have dinner and return the same evening. At the time of Benjamin Franklin's shop the boss worked usually with three or four men and was in constant touch with them. If they had troubles they could take them up with him personally. If the boss didn't treat them right they could get into touch with him physically, if necessary.

In these days with million dollar corporations controlled in New York, with the workmen scattered all over the country, it is necessary to build up machinery to replace the old contact between men and management. To my mind industrial engineering, employees' representation, and most of the things such as we are discussing here tonight are simply an effort to return to that old contact between the owner and the men. The employees' representation plan is, as I say, before every country. The experience in Italy has been a valuable lesson in that it has shown a great many of the more radical that there is such a thing as management, and that there is such a thing as capital and the entrepreneur, and that each have their place just as do the tools and the men in industry.

* * * *

MR. HARRINGTON EMERSON: (New York) One doesn't have to do very much for young people. It is enough to be young. Life is filled with all sorts of pleasures to those who are young but it is the old who are critical, those who have passed through a great many experiences, whose appetites are jaded. When you have pleased the old people, therefore, you have done something, you can be certain that you have done something.

Mrs. Emerson and I have been attending conventions of engineering

societies for over thirty years. For a long time we attended the various conventions of the American Society of Mechanical Engineers and then some of the other societies. We attended them in the South and in the West, we attended them everywhere and in all our experience I think we never attended any convention where we found it so pleasant, so agreeable, where so much was done by the local people in charge and the citizens to make the occasion an enjoyable one to the visitors. So I should like to offer a resolution of thanks on behalf of The Society of Industrial Engineers to the local chapter and to the citizens and the committees who have done so much to make this visit to us so very pleasant a one:

RESOLVED: That The Society of Industrial Engineers expresses its appreciation of the unusual and splendid effort made, resulting in the success of the convention. Especially do we thank Mr. Ford, President of the Local Chapter, Mr. Lutterbach, Secretary-Treasurer, Messrs. Putnam and Janke, for hotel reservations, and Mr. Meyen for trips.

Especially did all the visitors enjoy the Fashion Show, the great work being fully appraised.

The Exhibitors also deserve our thanks for their instructive and progressive exhibits.

The resolution was seconded and carried.

THE CHAIRMAN: Mrs. Emerson would like to say a word. (Applause.)

MRS. HARRINGTON EMERSON (New York): In the name of the visiting ladies I wish to offer a resolution of thanks to the Chairman, Miss Mildred T. Smith, and all the members of the Ladies' Reception Committee for their untiring and most successful efforts in entertaining us during our stay in Milwaukee. The beautiful drives to the Parks, and the visits to the different plants were most enjoyable and instructive, and the crowning entertainment, the Fashion Show, was something to remember with greatest pleasure. Especial thanks and appreciation are due to Miss Martin, Mrs. Baum, Mrs. Meyen, Miss Alice Smith, Mrs. Ford, Mrs. Lutterbach, Mrs. Meyer and Mrs. Schumacher, as well as many others of the Committee.

The resolution was seconded and carried.

MR. W. S. FORD (Milwaukee): As president of the Milwaukee Chapter I sincerely thank Mr. and Mrs. Emerson for the resolutions just adopted, and I want to take advantage of this opportunity to express my thanks to the members of the chapter for their work before and during the convention, a more willing group of workers I have never had the pleasure of being associated with. Their team work made the work a real pleasure. And, in behalf of the local chapter I thank some of the visiting members who have served on various committees and who have helped us.

We surely appreciate your forgiving some of the little things that always slip when in the care of a hastily gathered together organization. However, with the experience we have gained we promise to do better next time and sincerely hope that the Society will again hold a national convention in the Cream City.

THE CHAIRMAN: Mr. Edward J. Lowman, of the Shepard Electric Crane and Hoist Company has prepared a paper on "Co-ordination of the Personnel and Production Departments". He will discuss the topic from the viewpoint of the Production Manager.

"CO-ORDINATION OF THE PERSONNEL AND PRODUCTION DEPARTMENTS"

EDWARD J. LOWMAN

Industrial Engineer, Shepard Elcc., Crane & Hoist Co., Montour Falls, N. Y.

Well within the memory of most of us there was what you could term "shirt-sleeve management". The owner of the business worked shoulder to shoulder with the "gang." He knew them well, also their families. If any one of them was in trouble or had worries at home, the "boss" was the first one to know of it and lend a hand. If there was sickness at home, ten to one the boss' wife was the one to run in and help out. If business was good and money made, it was shop talk and the whole crew felt they had had a part in the success of the business. If times were bad and jobs hard to land, the matter was talked over and if a job was taken at the low figure to keep the men going, they all knew it and jumped into the work to save the company from a loss and themselves from walking the streets.

Then along came big business, followed by the period of the so-called "soulless" corporation. That was a legal saying, but twisted to mean something else.

The greatest mistake in American corporate life was the idea that a corporation could put things over on employes from long range, providing the range was long enough and the stockholders were far enough removed from the actual management of the business.

Perfectly good, sincere, true men and women who had large interests in corporations did not give one moment's concern as to how the corporation was run, or how the money was earned, with which the interest on their stock was paid.

Men, sitting on boards of directors, would do things as directors that they would not think of doing as individuals.

That condition of things made a wonderfully fertile spot for the muck-raker and the agitator to plant their seeds of discontent.

Then one day the corporations found they had a conscience, if they didn't have a soul, and that conscience began to prick. Then the greatest axiom in industrial life was discovered; that the lives of men and women were more important than machinery; that human happiness was of as much value as money. Then we began to have all sorts of human welfare movements for the conservation of human life and human happiness in industry. We began to get safety-first devices, recreation periods, amusement rooms for employes. It is the most hopeful thing in America today, this new relationship between corporations and the people that corporations employ.

Under the old "shirt-sleeve" management things were from the heart of the boss to the heart of the employe. They were friends and there was no feeling of paternalism, which is so hard to overcome by the organizations of today.

The question which is forever cropping up is, how can the business organizations of the modern type nearly approach that old type and really get to the men. You have heard how the larger corporations handle that work, but the smaller business, just too large to get the personal touch with all the men and yet too small to organize on the scale of the larger business, has never had much of a hearing. It is that smaller type of organization that I am going to talk about.

An engineer, drawing a set of plans for a machine shop to house 500 people must go into as much detail as he would to draw the plans of a shop to house 5000 men, if he expects to get the smaller shop built as he wants it and with a reasonable amount of supervision.

The same is true of your organization chart. There is a tendency on the part of small shops to stick their tongues in their cheeks and say "high-brow" stuff at a good many things. To that class of shops I have this to say: You cannot start out on a twenty-five mile auto trip without some advance thinking as to what you are going to do and where you are going. You cannot just start the engine and sit. You can, perhaps, but if you do you will soon run amuck.

What I am driving at is this: charts, written organization instruction manuals may seem and look "high-bow," but what are they, in fact? Just plain, everyday thinking things out when you have the time to think and not under pressure of quick action. The thinking has to be done and you men have to do it. The only question is, are you going to record your thoughts so you can use them the second time, or are you going to wait until you are up against it some time, to know how to do this, that or the other thing and then make a hasty decision that you might regret the next day.

You have to think. How are you going to do it? Why do you make a drawing when you want some piece machined to fixed dimensions? Because it is the easiest way to record your thoughts so another can understand what you want. It is just as necessary in recording your thoughts relative to the mode of procedure in a plant. It is the easiest way to think things out. It is the easiest way to transfer your thoughts to the next individual. They can know the how and why of things. If they don't agree, changes can be made and matters adjusted before any friction develops and any heat is generated.

I do not mean to say that all the charts in Christendom will eliminate all the friction or misunderstandings in an organization. When you are dealing with executives and foremen you are, if you have worthwhile foremen and good executives, dealing with people of strong opinions and personalities and assertiveness, and all the other adjectives that go with them, thrown in. They are men with many traits alike. You run steel against steel and you get heat. The same is true of dispositions. The more you pre-determine the how of things and then record that how so as to enable others to know of it, the less friction you get with less resulting heat.

I am going to show a chart illustrating how one manufacturer co-ordinates production with personnel work, and with very little trouble; in fact they are quite a happy family.

Notice that the Production Planning Department makes out a schedule in man hours, by departments, both machine and assembly, for each month's business. A copy of this schedule is sent to the Assistant Superintendent, who is in charge of processing, and a copy to the Employment Department. These two men have a conference, based on the requirements of this monthly schedule. For example, suppose their parley brings out the fact that more men must be put on to take care of the work scheduled for the coming month. Action to get the necessary help starts at "A" on the blue line, or the Employment Department. The Employment Department passes the requirements thru applications for employment; arranges to interview applicants for positions; explains to them the labor policies of the concern, etc. If the applicant is taken on he is given instruction booklets covering the rules of the shop, Employes' Relief Association instructions, safety-first instructions and is introduced to the foreman, then passed on into the department.

In case the conference develops the fact that we are about to have too much help, action is started at "B" on the blue line and at "C". The foreman of the department looks over his men to determine which he can best do without. The Employment Department looks up the records of the men in the department that has a surplus, then the Employment Department

SHEPARD
ELECTRIC CRANE & HOIST CO.

**COORDINATION OF PRODUCTION
AND
PERSONNEL DEPT'S.**

Production Planning Department
1 NOTICE OF WORK HOURS IN NEXT MONTH'S SCHEDULE.

SUPERINTENDENT

DISPATCH OFFICE
LABOR PLANNING

COOPERATIVE PLANNING BY
ASSISTANT Supt. EMPLOYMENT

11
TIME DEPARTMENT

6 LABOR SHORTAGE.
THIS MAY BE DUE TO FLUCTUATION OF
WORK IN THE DEPARTMENT OR WORK IN THE
DEPARTMENT FOREMEN.
7 LABOR SURPLUS.
THIS MAY BE DUE TO FLUCTUATION OF
WORK IN THE DEPARTMENT OR WORK IN THE
DEPARTMENT FOREMEN.
10 CHANGE OF HOURLY RATES

LAI D OFF OR FIRED.

EMPLOYMENT MANAGER
12 TRAINING
FOUNDRY, G.
BENEFIT ASSOC.
CHERRY
DEATH BENEFIT
12 SAFETY
HEALTH
MEDICAL EXAM.
FIRST AID
COMPENSATION
9 PROMOTION
TRANSFERS
FIRING
8 RECORDS
REPORTS
LABOR STAT.
4 INTERVIEWING
EXPLANATION OF
LABOR POLICIES
HIRING.
2 LABOR
RECRUITING
LABOR PLANNING

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APPENDIX 1
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and the foreman of the processing department come together, go over the records, take into consideration all the facts known to it, then the surplus in the department is either transferred, temporarily laid off or discharged. In normal times the lack of labor or surplus can be taken care of by transfers in force.

In case a foreman wants to get a man out of his department for any reason, the cycle starts at "C" on the blue line, goes to the Employment Department, through the Employment Department records, promotions, transfers, etc. and the man is either transferred to some other department needing assistance, temporarily laid off or discharged.

In case a foreman wants a change in rate for a man in his department, action starts on the purple line under "change of hourly rate." The card goes through the Employment Department, there the records are searched against the employe, his record as to absenteeism, production, bonus, earnings, etc., are investigated and if the Department feels that an advance in rate is justifiable, then the card is sent to the general superintendent and in case he OK's the card, it goes on through to the Time Department to make the necessary records on the payroll sheets and notice is sent by the Time Department to the foreman, giving him the date on which the new rate will start. If anywhere on this line of action any department turns the card back or rejects the application for raise in rate the card finally is returned to the foreman making the application for the raise and he has the privilege, in case he believes that an injustice has been done, to state his reasons for such belief and to send the card back out on its route again.

The green line on the chart merely indicates the points of contact between the Employment Department, processing and general administration.

While all of the training, housing, benefit association, library, etc., are not actually conducted or supervised by the Employment Department, yet the Department is constantly in close touch with these different activities and conveys its opinion of their benefit or detriment to the organization, to the officers who have the responsibility of the success of the business on their shoulders.

One of the benefits, and the principal benefit of the charted organization, as found by the concern using the chart just mentioned, is that there is a clear understanding of what the other fellow is doing, what he is driving at. If some over-ambitious person strays from the path and gets into his neighbor's private preserve, there is no opportunity for a long, heated discussion. The chart points the way. It has been passed on by the officers of the company, and was put in use after a conference where an opportunity was given to protest in advance. No changes are made without all affected being given notice and an opportunity to protest.

Our plant is located in a small New York State village. The living conditions are what we make them, for we are in the majority. The "Big Family" idea is always in evidence. To better tell you how it is done by some, I am going to show you a "movie" of our Annual Family Outing. With that completed I bid you good night.

THE CHAIRMAN: I regret very much that our president, Mr. Wallace, is not here to fittingly express how much we regret leaving Milwaukee. You know that industrial engineers are famous for finding out the truth. That is exactly what we have done here in Milwaukee. We have gotten to the bottom of the matter as to what it really was that made Milwaukee famous. We are convinced it was her splendid hospitality.

...

FINAL ADJOURNMENT

EXISTING COURSES IN INDUSTRIAL ENGINEERING

Tables referred to in article by Prof. Collins P. Bliss on pages 175-182

TABLE SHOWING GENERAL SUMMARY

INSTITUTION	General Subjects		General Engineering Subjects		Specific Subjects		TITLE OF COURSE
	Class Hours	Per Cent	Class Hours	Per Cent	Class Hours	Per Cent	
Mass. Inst. of Technology	1110	40.3	1160	42.0	490	17.7	Engineering Administration
Penn. State College	960	30.1	1380	43.2	855	26.7	Industrial Engineering
Sheffield Scientific School, Yale	995	37.2	1020	38.3	660	24.5	Administrative Engineering
Columbia University	*1080	32.0	975	28.5	1335	39.5	Industrial Engineering
New York University	1095	38.1	975	34.0	805	27.9	Industrial Engineering
University of Pittsburgh	900	33.2	1236	45.6	576	21.2	Industrial Engineering
Purdue University	630	28.8	690	31.4	880	39.8	Industrial Engineering
AVERAGE	967	34.2	1062	37.6	772	28.2	

*This figure is based on an average of hours in "General Subjects" at the other Universities assumed for purposes of comparison.

GENERAL SUBJECTS

GENERAL
ENGINEERING
SUBJECTS

INSTITUTION	Math.		Lang.		Science		M. E.		C. E.		E. E.	
	Cl. Hrs.	%	Cl. Hrs.	%	Cl. Hrs.	%	Cl. Hrs.	%	Cl. Hrs.	%	Cl. Hrs.	%
Mass. Inst. of Technology	180	6.6	240	8.7	690	25.0	790	28.6	220	8.0	150	5.4
Penn. State College	270	8.4	*45 270	10.0	375	11.7	870	27.2	300	9.4	210	6.6
Sheffield Scientific School	240	9.0	†90 200	10.8	465	17.4	645	24.2	285	10.6	90	3.5
Columbia† University					** 135		600	17.7	225	6.5	150	4.3
New York University	210	7.3	225	7.9	660	22.9	570	20.0	225	7.8	180	6.2
University of Pittsburgh	240	8.8	156	5.8	504	18.6	612	22.6	444	16.4	180	6.6
Purdue University°	330	15.0	60	3.0	240	10.8	495	22.5	120	5.5	75	3.4
AVERAGE	245	9.2	240	7.7	438	17.7	655	23.2	260	9.2	148	5.1

*Modern Economic History

† History and Government

‡ Six-Year Course—3 years Industrial Engineering

° Class Hours based on credit hours multiplied by 15

** This figure represents hours given in the three-year course in addition to those in the preliminary college course.

SPECIFIC SUBJECTS

INSTITUTION	Human Relations		Production		Marketing		Finance and Law		Total Class Hours
	Class Hrs.	Per Cent	Class Hrs.	Per Cent	Class Hrs.	Per Cent	Class Hrs.	Per Cent	
Mass. Inst. of Technology	70	2.5	240	8.7			180	6.5	2760
Penn. State College	150	4.7	585	18.3			120	3.8	3195
Sheffield Scientific School, Yale	135	5.0	270	10.0	90	3.2	165	6.2	2675
Columbia University	120	3.5	1050	31.1			165	4.8	3390***
New York University	180	6.3	295	10.0	210	7.4	120	4.2	2875
University of Pittsburgh	108	4.0	132	4.8	168	6.2	168	6.2	2712
Purdue University	460	20.8	330	15.0	30	1.3	60	2.7	2200
AVERAGE	175	6.7	415	14.0	124	4.4	142	5.0	2829

*** This figure is made up of the hours indicated plus the average of the hours in the "General Subjects" for the sake of comparing all four-year courses.

Proposed Course

THE SOCIETY OF INDUSTRIAL ENGINEERS

Industrial Engineering

General Subjects	Mathematics	Algebra Trigonometry Analytical and Descriptive Geometry Calculus (Optional)
	Language	English Composition and Literature Public Speaking Modern Language (Optional)
	Science	Physics Chemistry (Industrial Applications) Hygiene and Physical Culture
General Engineering Subjects	M. E.	Drawing Machine Design Mechanical Laboratory Elementary Power Engineering
	C. E.	Properties of Materials Strength of Materials
	E. E.	Covered in Physics
	Human Relations	Psychology (Optional or P. G.) History of Industry Philosophy of Industry
Specific Subjects	Production	Statistics and Statistical Control Factory Organization and Management Cost Analysis Shop Practice (principles)
	Marketing	Industrial Relations Finance and Marketing (Optional or P. G.)
	Finance and Law	Principles of Economics Business Law (Optional or P. G.) Economic Problems of Industry

MASSACHUSETTS INSTITUTE OF TECHNOLOGY

Engineering Administration

General Subjects	Mathematics	Analytical Geometry Calculus Differential Equations
	Language	English and History Written and Oral Reports Engineering Addresses
	Science	Chemistry Physics Military Science
General Engineering Subjects	M. E.	Drawing and Descriptive Geometry Machine Tool Work Mechanism (Kinematics) Machine Design Engineering Laboratory Heat Engineering Electives
	C. E.	Analytical and Applied Mechanics Materials of Engineering Hydraulics
	E. E.	Elements of Electrical Engineering Central Stations Electrical Laboratory
	Human Relations	Industrial Relations Labor Problems and Sociology History of Industry
Specific Subjects	Production	Accounting Industrial Organization Statistics Business Management Cost Analysis
	Marketing	Sales, Advertising and Trade under "Business Management"
	Finance and Law	Political Economy Business Law Banking Securities and Investments

PENNSYLVANIA STATE COLLEGE

Industrial Engineering

General Subjects	Mathematics	Trigonometry Analytical Geometry Calculus
	Language	English Composition Argumentation Public Speaking Modern Language
	Science	Physics Chemistry Military Science
		Modern Economic History
		Shop Work (Forge, Foundry, Machine, Woodworking)
General Engineering Subjects	M. E.	Kinematics of Machinery Drawing and Descriptive Geometry Heat Engineering and Power Plants Machine Design Mechanical Laboratory
	C. E.	Elementary and Applied Mechanics Engineering Materials Mill Building Design Metallurgy of Iron and Steel
	E. E.	Dynamo Machinery Industrial Electrical Applications Electrical Engineering Laboratory
	Human Relations	Principles of Industrial Engineering Psychology Social Service Political Parties
		Accountancy and Industrial Acc'ts. Scientific and Shop Management
Specific Subjects	Production	Factory Planning and Inspection Trips Industrial Management and Organization Time and Motion Studies
	Marketing	
	Finance and Law	Engineering Law and Contracts Principles of Economics Money and Banking or Commerce Subjects

**YALE UNIVERSITY
SHEFFIELD SCIENTIFIC SCHOOL**

General Subjects	Administrative Engineering				
	Mathematics	Algebra Trigonometry Analytical Geometry Calculus			
		Language	English Literature Report Writing and Composition Public Speaking Modern Language *		
			Science	Physics Chemistry	
				History and Government	
	General Engineering Subjects		M. E.	Engineering Practice Drawing and Descriptive Geometry Water and Heat Power Engineering Mechanical Laboratory	
		C. E.		Mechanics and Structural Design Strength of Materials & Metallurgy General Contracting **	
				E. E.	Fundamentals of Electricity Generation Transmission Industrial Applications **
					Human Relations
		Specific Subjects	Production		
Marketing				Sales and Advertising Statistics Transportation **	
				Finance and Law	Business Administration Business Finance Business Law Specifications and Contracts

* Junior Electives

** Senior Electives

COLUMBIA UNIVERSITY

Industrial Engineering

General Subjects	Mathematics	NOTE: All general subjects covered in three-year college course.
	Language	
	Science	
General Engineering Subjects		Physical Laboratory Engineering and Industrial Chemistry
	M. E.	Power Generation Machine Elements Engineering Thermodynamics Mechanical Laboratory Machine Design and Analysis
	C. E.	Metallography Mechanics Strength of Materials
	E. E.	Direct and Alternating Current Electrical Laboratory
	Human Relations	Public Aspects of Business Labor Problems
Specific Subjects	Production	Principles of Accounting Factory Cost Analysis Business Statistics Factory Management & Equipment Manufacturing Processes Analysis of Productivity Selected Industries
	Marketing	
	Finance and Law	Principles of Money and Banking Business Law Corporation Finance

NEW YORK UNIVERSITY**Industrial Engineering**

General Subjects	Mathematics	Algebra Trigonometry Analytical Geometry Calculus
	Language	Rhetoric and Composition Technical Writing Survey of Scientific Literature Public Speaking Modern Language or American Government
	Science	Physics Chemistry Military Science and Hygiene
General Engineering Subjects	M. E.	General Engineering Practice Drawing and Descriptive Geometry Applied Kinematics Heat Power Engineering Mechanical Laboratory
	C. E.	Analytical and Applied Mechanics Properties of Materials Hydraulics and Hydraulic Motors
	E. E.	Direct Current Alternating Current Industrial Applications of Electricity
Industrial Subjects	Human Relations	Psychology or Modern Language Industrial Relations and Employ- ment Economic or Administrative Prob- lems (Thesis)
	Production	Bookkeeping and Accounting General and Cost Accounting Factory Organization Industrial Engineering Shopwork and Methods
	Marketing	Advertising and Selling Trade and Transportation Economic Geography
	Finance and Law	Business Organization Principles of Economics Engineering and Commercial Law

UNIVERSITY OF PITTSBURGH

Industrial Engineering

General Subjects	Mathematics	Algebra Trigonometry Analytical Geometry Calculus
	Language	English Report Writing
	Science	Physics Chemistry
General Engineering Subjects	M. E.	Shop Work—(Forge, Foundry, Machine Machine Design Heat Power Engineering
	C. E.	Surveying Mechanics Mechanics of Materials Hydraulics
	E. E.	Direct Current Alternating Current
	Human Relations	Psychology Industrial Employment Personnel Administration
	Production	Industrial Statistics Cost Accounting Shop Methods Time and Motion Studies
Specific Subjects	Marketing	Advertising (To be treated under Sales Management) Sales Engineering Sales Management Transportation and Foreign Trade
	Finance and Law	Credit and Banking Corporation Finance Business Law Contracts and Specifications

PURDUE UNIVERSITY**Industrial Engineering**

General Subjects	Mathematics	Algebra Trigonometry Analytical Geometry Calculus
	Language	English or Modern Language
	Science	General Chemistry General Physics Military Science Personal Efficiency (Hygiene)
		Mechanical & Machine Drawing Shop Work (Woodworking, Forge and Foundry, Machine)
General Engineering Subjects	M. E.	Kinematics and Machine Design Engines and Boilers Power Plants and Transmission Heating and Ventilating Mechanical Laboratory and Seminar
	C. E.	Analytical Mechanics
	E. E.	Elements of Electrical Engineering Industrial Lighting
	Human Relations	Measuring Mental Ability and Achievement Psychology (General and Educa- tional) Safety Engineering and First Aid Labor Problems and Sociology Human Nature and Industry Fundamental Laws and Principles of Human Relations
Specific Subjects		Employment Management Time and Motion Studies Shop Course in Manufacturing Industrial Equipment Factory Layout and Management Systems
	Production	Cost Accounting Industrial Engineering
	Marketing	Salesmanship
	Finance and Law	Elementary Economics Business Statistics

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Marquette University kindly furnished a corps of students to act as ushers during the convention.

To Dean Pinney, Professor Bliss and the students we are indebted for the services rendered.

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To the manufacturers of Milwaukee and nearby cities who invited those attending the S. I. E. convention to inspect their plants, we are very grateful.

During the three days of the convention it was impossible to take advantage of all the invitations, but the spirit of hospitality which prompted these numerous invitations was nevertheless appreciated.

We especially thank—

ALLIS-CHALMERS COMPANY
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for their kindness in showing visitors through their plants and explaining the various operations and methods.

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WILL BE HELD AT

Springfield, Mass.

ON

October 5, 6 and 7, 1921

Major Subject

“Industrial Stability”

covering Manufacturing Distribution, Finance and Accounting

The Meetings will be held in the Auditorium

*Special Features will include
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Convention programs will be ready for distribution about September 1st.
Copies may be obtained from the office of the Society, 327 S. LaSalle St.,
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THE OBJECT OF The Society of Industrial Engineers

I—To furnish a medium for bringing out original contributions to the science of management.

II—To provide an organization through which persons who are applying scientific methods to the solution of the problems of production and distribution may exchange views and co-ordinate their efforts.

III—To co-operate with other societies.

IV—To codify and standardize professional principles and practice.

V—To develop the professional standards of the Industrial Engineer.

VI—To promote efficient energy-conserving management.

VII—To enhance the efficiency and prosperity of American Industry.

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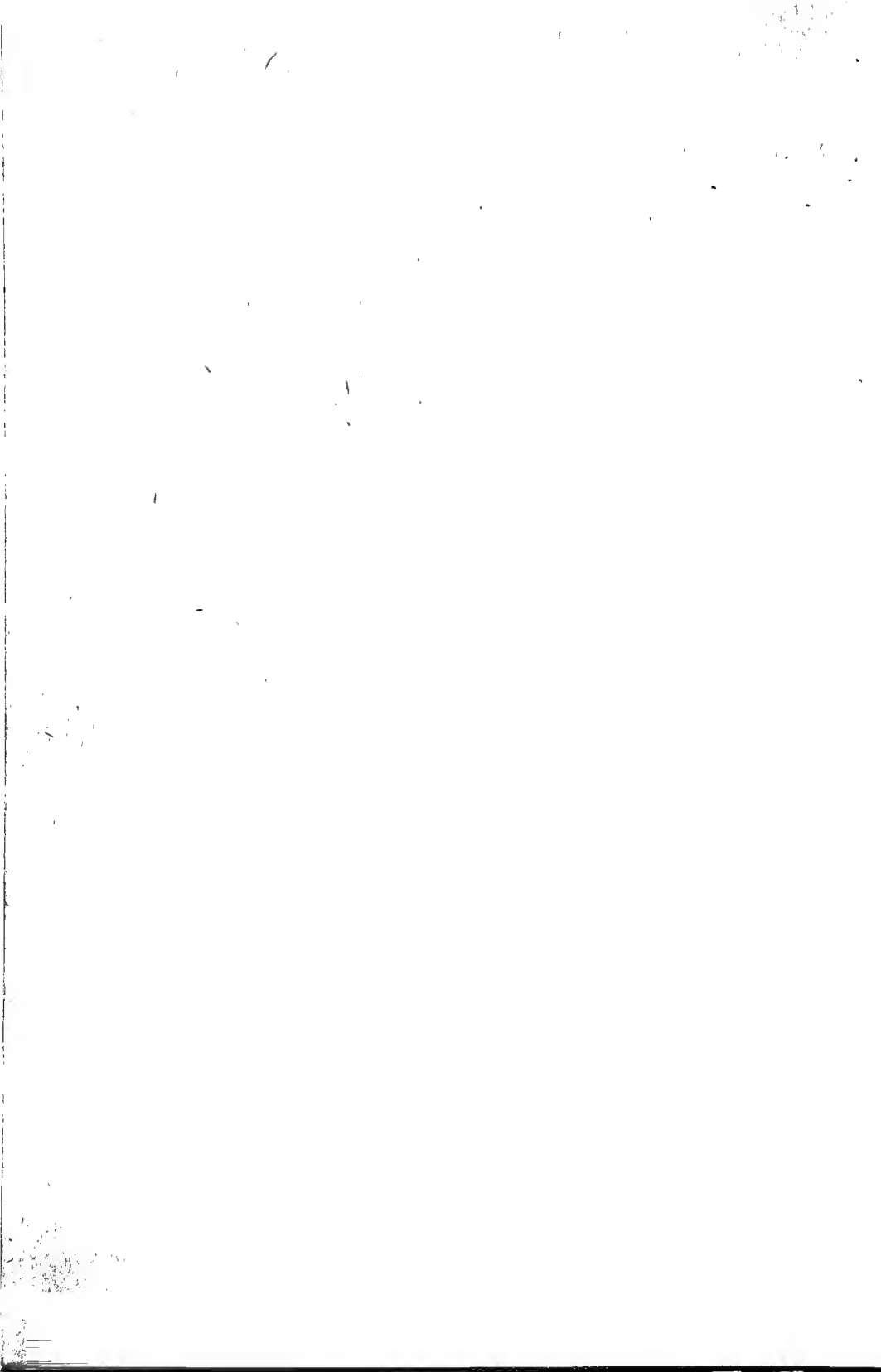
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Other chapters will be organized during 1921.

Each Chapter meets every month





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